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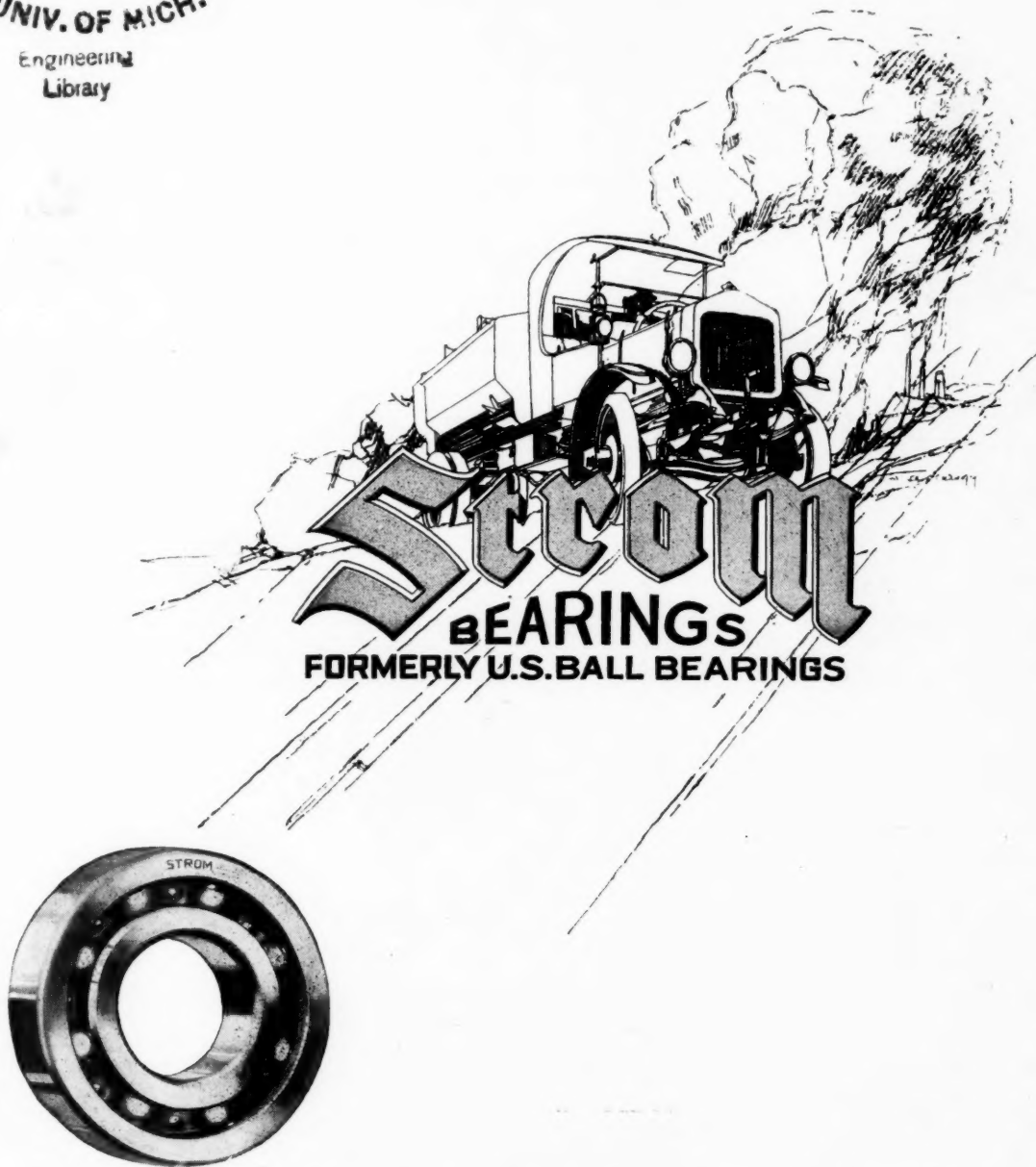
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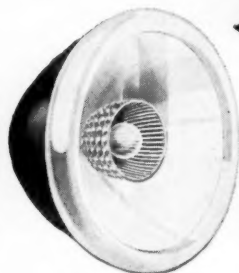
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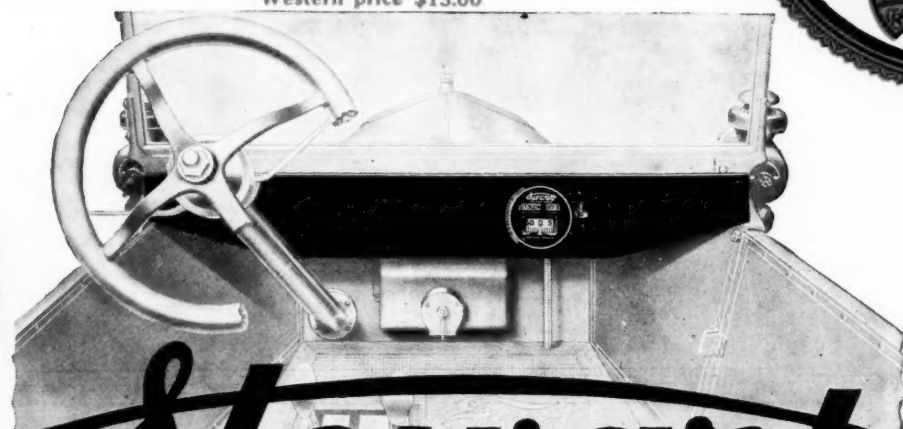
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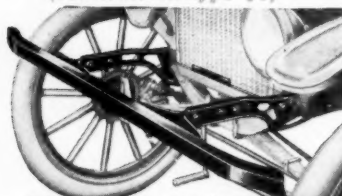
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# AUTOMOTIVE INDUSTRIES

## The AUTOMOBILE

VOL. XXXIX

NEW YORK, THURSDAY, DECEMBER 5, 1918—CHICAGO

No. 23

## Tractor Prospects in Siberia and Central Asia

Almost Unlimited Possibilities in Asiatic Russia—Population  
Has Been Largely Increased by Refugees from  
War and Revolution Swept Districts

By N. A. Stephanoff, M.E., Ph.D.\*

THE question of industrial intervention in Siberia is now occupying the minds of many persons in the industrial circles of the United States. I regret to state, however, that the chaotic political situation in Russia, her internal troubles, the lack of reliable sources of information as to her economic conditions, and particularly those of Siberia and Central Asia, have so far prevented America from formulating any definite policy with regard to these countries, as far as economic assistance is concerned.

It is clear that Russia, and first of all Siberia and Central Asia, will greatly depend upon the United States, both politically and economically. It may be taken for granted that the big financial interests of America have already laid down a plan of action for the future industrial intervention in Siberia, and that they have taken full advantage of the lessons learned by French and Belgian concerns in Russia, who made the error of going there without sufficient preliminary study, and in consequence soon failed in competition with German capital, whose representatives are well organized and possess a thorough knowledge of Russian conditions.

### Unlimited Possibilities

From an industrial and economic point of view, Russia, and especially Siberia, Central Asia and Caucasia, are countries of unlimited possibilities. It is necessary,

however, to note that the opportunities exist only for a well-organized enterprise with a definite business program and a thoroughly developed plan of industrial intervention. Every adventure of a profiteering character is bound to fail—after a possible temporary success—when Russia will have recovered physically and morally.

### Stable Market Depends on Stable Buyers

Every student of industry well knows that a stable market for his goods depends upon stable buyers. Now, such a market can be created in Siberia and Central Asia in a short time. During the war and the revolution there was a great rush into Siberia of refugees from Poland and European Russia, with the result that the consumption there far exceeds the production of all articles of prime necessity. This raised the cost of living enormously. The issuing of large quantities of paper money and its accumulation in the hands of the farmers (about 10,000,000,000 roubles in Siberia and Central Asia alone) completely ruined the commercial machine, as the farmers could buy nothing from the cities, and therefore refused to sell their produce to them.

The industry of European Russia and Poland before the war was to a great extent under the control and influence of Germany. It is for this reason that the development of such important industries as sugar refining, textile manufacturing, etc., had been artificially hampered. Neither sugar nor clothes are to be found in Siberia and Central Asia now, nor any considerable

\*The author would like to express his indebtedness to O. A. Malychévitch, aeronautical and mechanical engineer, for assistance in collecting data concerning tractors.



TABLE 1  
SIBERIA

Provinces	Men	Women	Total	CITY		COUNTRY	
				Per Cent	Total	Per Cent	Total
1. Amour.....	225,000	225,000	450,000	45.2	203,400	54.8	246,600
2. Eniseisk.....	750,000	750,000	1,500,000	31.6	473,300	68.4	1,026,700
3. Transbaikal.....	750,000	750,000	1,500,000	33.1	496,400	66.9	1,003,600
4. Irkutsk.....	750,000	750,000	1,500,000	27.7	416,100	72.3	1,083,900
5. Primorskaya.....	500,000	500,000	1,000,000	58.2	581,600	41.8	418,400
6. Tobolsk.....	1,300,000	1,300,000	2,600,000	27.2	706,200	72.8	1,893,800
7. Tomsk.....	2,875,000	2,875,000	5,750,000	30.8	1,770,650	69.2	3,979,350
8. Jacoutsk.....	225,000	225,000	450,000	22.3	100,200	77.7	349,800
	7,375,000	7,375,000	14,750,000	....	4,747,850	....	10,002,150

## CENTRAL ASIA

Provinces	Men	Women	Total	CITY		COUNTRY	
				Per Cent	Total	Per Cent	Total
1. Akmolinsk.....	950,000	950,000	1,900,000	14.7	297,300	85.3	1,602,700
2. Transcaspiia.....	312,500	312,500	625,000	14.0	87,500	86.0	537,500
3. Samarkand.....	750,000	750,000	1,500,000	16.4	246,000	83.6	1,254,000
4. Semipalatinsk.....	550,000	550,000	1,100,000	7.9	86,900	92.1	1,013,100
5. Semirechensk.....	800,000	800,000	1,600,000	9.3	148,800	90.7	1,451,200
6. Sirdaria.....	1,225,000	1,225,000	2,450,000	14.6	357,700	85.4	2,092,300
7. Turgay.....	425,000	425,000	850,000	6.7	56,950	93.3	793,050
8. Ural.....	525,000	525,000	1,050,000	9.8	102,900	90.2	947,100
9. Fergana.....	1,337,500	1,337,500	2,675,000	19.6	324,300	80.4	2,150,700
	6,875,000	6,875,000	13,750,000	....	1,890,350	....	11,859,650

quantity of shoes, consequently the balance of foreign trade will be very unfavorable to these countries during the first years after the conclusion of the war. Any considerable export of grain from western Siberia cannot be counted upon, as the normal conditions of trade between Siberia and European Russia, and through the latter with western Europe, will not be re-established in the near future. The Far Eastern markets and the Pacific Coast are inaccessible as yet because of lack of cheap transportation.

Siberia and Central Asia need not and will not be exclusively agricultural countries, as they possess immense natural resources (iron, copper, timber, coal, etc.) sufficient for an extensive industry.

### Siberia in Need of Manufacturing Facilities

The most urgent need in Siberia and Central Asia is the creation of facilities for manufacturing articles of prime necessity, such as sugar, textiles, shoes, etc. By creating such industries and by cultivating the personal requirements it would be possible to enhance the general welfare and the standard of intelligence of the population. It is necessary to establish an intensified agriculture comprising the raising of cotton, flax and hemp, cattle raising, the production of vegetable oils and animal fats, etc.

If this be the case, then there is in Siberia and Central Asia an immense opportunity for tractors, together with all the latest types of agricultural implements.

According to figures given in the "Statistical Annual" of the Russian Bureau of Trade and Industry for 1914,

TABLE 2  
DAILY FOOD RATION PER PERSON  
(SIBERIA AND CENTRAL ASIA)

Grammes per Person with Ordinary Work—Continued	Bread (in Grain)	Fresh Potatoes	Fat	Cereals (in Grain)	Fresh Vegetables	Sugar	Meat	Total
Full ration.....	674.3	472.0	13.48	205.0	410.0	13.48	....	1788.26
Protein.....	80.43	10.0	0.60	20.05	37.27	....	....	148.35
Fat.....	11.98	0.66	10.78	6.48	2.58	....	....	32.48
Carbohydrates.....	433.0	107.19	....	124.7	109.63	12.13	....	786.65
Fuel value in calories.....	2219	486	100	654	626	50	....	4135
Half ration.....	337.15	236.0	13.48	102.5	410.0	13.48	....	1162.6
Protein.....	40.21	5.0	0.60	10.03	37.27	....	....	93.11
Fat.....	5.99	0.33	10.78	3.24	2.58	....	....	22.92
Carbohydrates.....	216.5	53.6	....	62.3	109.63	12.13	....	454.2
Fuel value in calories.....	1109.5	243	100	327	626	50	....	2455.5

and in the "Statistical Yearbook" of the Central Committee on Statistics of the Russian Department of the Interior, the population of Siberia in 1915 amounted to 10,377,900, Central Asia having at the same time 11,254,000. Data collected by the writer while in Siberia in 1917 indicate that it would be more correct to estimate the population of Siberia toward the end of 1918 roughly at 14,750,000, and that of Central Asia at 13,750,000 (see Table 1). The increase in population has been almost entirely in the cities and towns. We are justified in assuming that the bulk of this immigrated population will not return home after the war is over and conditions in Russia have improved; on the contrary, we may even expect a further tide of new immigrants from European Russia, and in the first place of the lower middle class.

In order to answer the question as to how large will be the area of land that will be cultivated in Siberia in the near future, we must not only know precisely the population of the country but also the minimum food ration per person available, as well as the amount of man power.

Siberia and Central Asia, as a whole, had never known starvation. Making an exception of the nomadic tribes, the food of the people used to be quite sufficiently varied, and contained enough meat, milk and fats. In this respect western Siberia, the province of Akmolinsk, and the neighboring regions of Central Asia, enjoyed especially favorable conditions. They exported a considerable part of their agricultural produce to eastern Siberia, to the provinces of Fergana and Trans-Caspia. This district is still the granary of Siberia and Central Asia; but there is one obstacle to further development: The farmers of the above mentioned fertile regions make no effort to increase the cultivated area to any extent, having no inducement to do so.

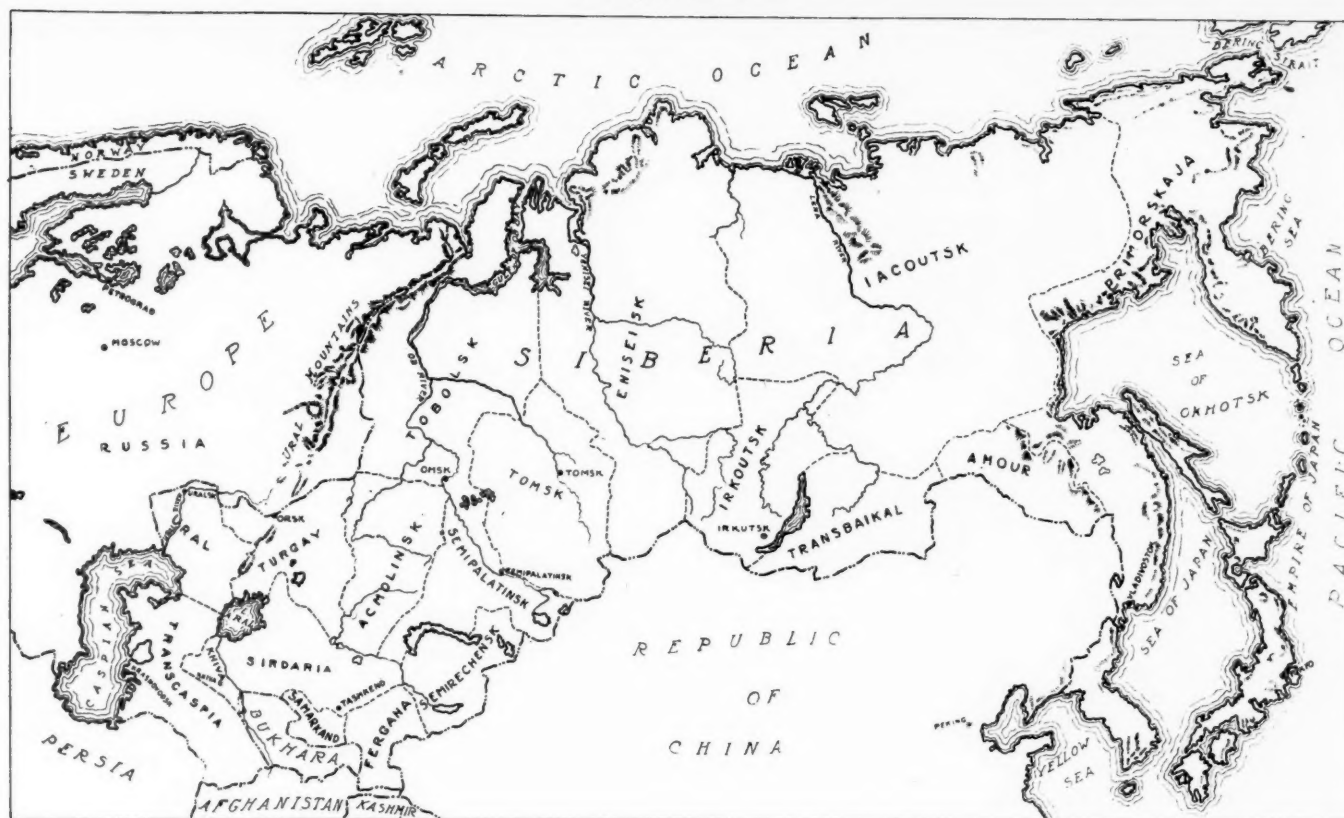
### Cities on Reduced Ration

As to the cities, they cannot expect to receive a full food ration for a few years to come, as they have nothing to give the farmers in exchange for foodstuffs; this accounts for the diminished ration (Table 2) for the entire city population and the country population under 9 years of age. The meat and the milk rations are excluded, as they bear no direct relation to the cultivated area and consequently to the question of tractors. Most of the area under cultivation in Siberia and Central Asia is sown to wheat; rye and barley are raised in small quantities, the distribution depending entirely upon climatic conditions. Table 3 shows the quantities of different cereals sown in 1912 (see also Tables 12 and 13). The crop is the chief factor in calculating the cultivated area, but the amount of collected grain is also given. Yield of grain is expressed in Russia in poods per dessiatina (1 pood = 36.1 lb.; 1 dessiatina = 2.7 acres).

Because of lack of data the average yield cannot be given in definite figures for Siberia and Central Asia. For illustration, reference may be made to Table 4, giving the yield in Siberia and Central Asia for the period 1908-1912, and Table 5 for 1912. For the period since 1912 the calculations were made by assuming a yield of 40 poods wheat and 30 poods rye per dessiatina. To simplify the calculations, the area under cereals is assumed to be all under wheat; this assumption is warranted because the total wheat crop exceeds the amount of rye raised, both absolutely and relatively.

Tables 6 and 7 show the area which must be sown to breadstuffs in Siberia and Central Asia in order to furnish a full yearly bread ration per person, which we estimate at 15 poods, corresponding to a full daily ration of 674.3 grammes and a half ration of 337.1 grammes of grain per person. (See Table 2.)





Map of Siberia and Central Asia

The area under other cereals called for will be determined by the yearly rations of:

(a) Grits or gruel,\* such as buckwheat, millet, barley, oats, rice, etc., of which a full ration is 4.5 poods per person and a half ration 2.25 poods; and

(b) Potatoes, of which the full yearly ration is 19.5 poods per person.

The average yield (full crop less the amount of seed necessary for the next sowing) is estimated at 18 poods for dessiatina for buckwheat and millet, 350 poods for potatoes in Siberia, and 250 poods in Central Asia.

The yearly ration of fresh vegetables is made up of 40 per cent cabbage,† 40 per cent beans (yellow beans, lentils, peas, etc.), 10 per cent cucumbers, and 10 per cent beets. Other vegetables, such as carrots, parsley, lettuce, tomatoes, etc., are consumed chiefly in the cities.

On the basis of the above consumption figures the area of truck farms required to raise the necessary vegetables for the whole of Siberia and Central Asia is 400,000 dessiatina, in round figures. Out of this, 200,000 dessiatina probably could be cultivated by means of tractors. The rest would be small gardens cultivated by hand labor exclusively.

\*The consumption of meat and fats being insufficient, cereals will play a pre-eminent rôle in feeding the city as well as the country population of Siberia and Central Asia, especially children. Cereals are used almost exclusively hot, with butter or milk.

†Cabbage is chiefly used in form of sauerkraut; cucumbers are salted. These proportions of various vegetables are the most unusual ones among the Russian farmers.

When first considering Tables 8 and 9 there seems to be a contradiction between the area to be used under wheat and buckwheat in 1919 and the actually cultivated area in 1912, for instance. The population of Siberia and Central Asia in 1912 was about 19,500,000; in 1918 it will probably be about 28,500,000; i. e., 46 per cent larger. Besides, the western part of Central Asia and eastern Siberia formerly obtained a certain quantity of cereals from without (European Russia and Manchuria); in pre-war times, moreover, there was a more plentiful supply of meat and fats, so there was no such need of using cereals as substitutes. However, we need not discuss this question at length, as it has no direct connection with our problem.

Among the other agricultural products, flax and hemp deserve serious attention as oil-giving plants, because they can be successfully raised in Siberia and several provinces of Central Asia.

The amount of fats in the food ration is figured at a

TABLE 4

Year	SIBERIA				CENTRAL ASIA			
	WHEAT		RYE		WHEAT		RYE	
	Winter	Spring	Winter	Spring	Winter	Spring	Winter	Spring
1908.....	56.0	....	44.1	41.8	53.5	45.2	39.2	39.4
1909.....	41.5	....	37.1	36.0	46.1	38.0	34.1	27.6
1910.....	45.6	....	51.2	44.0	49.3	35.6	18.8	38.1
1911.....	33.9	....	38.9	37.3	39.0	25.6	9.2	25.8
1912.....	43.8	....	60.9	39.0	52.8	45.4	43.0	44.2

TABLE 3  
CULTIVATED AREA IN DESSIATINES (2.7 ACRES)

1912 r	Wheat	Rye	Barley	Oats	Buckwheat	Millet	Peas Lentils	Potatoes	Flax	Hemp	Total
Siberia.....	2,600,100	1,054,200	180,100	1,720,600	94,200	56,200	23,800	119,500	55,200	56,200	5,960,100
In per cent.....	43.6	17.7	3.0	28.8	1.6	0.9	0.4	2.0	0.92	1.08	100
Central Asia.....	2,848,600	149,200	291,500	367,400	3,200	431,400	22,500	37,400	77,900	8,100	4,237,200
In per cent.....	67.2	3.5	6.9	8.7	0.07	10.18	0.53	0.88	1.85	0.19	100

TABLE 5  
CROP

Siberia 1912	Buck- wheat	Millet	Barley	Peas Lentils	Potatoes	Oats
1. Amour.....	33.7	59.2	51.1	41.8	383.6	61.0
2. Eniseisk.....	17.2	22.6	46.4	31.8	387.3	46.3
3. Transbaikal.....	13.1	32.9	37.8	51.3	370.3	31.2
4. Irkutsk.....	13.0	13.7	45.1	23.3	606.8	35.4
5. Primorskaja.....	42.4	50.6	67.1	66.2	431.4	70.1
6. Tobolsk.....	28.9	26.9	71.2	43.0	408.2	45.2
7. Tomsk.....	18.9	13.9	51.5	31.4	394.9	49.0
8. Jacoutsk.....	.....	.....	.....	.....	.....	.....
Average.....	2,307,200 94,100 =25.2	1,228,000 56,000 =21.9	9,891,100 137,400 =52.8	832,300 25,400 =33.6	48,696,600 120,900 =402.8	84,161,600 1,772,300 =48.9

Central Asia 1912	Millet	Barley	Peas Lentils	Potatoes	Oats	
1. Akmolinak.....	18.2	37.6	25.3	216.6	38.8	
2. Transaspian.....	42.6	37.7	.....	286.3	40.4	
3. Samarkand.....	54.2	34.3	39.1	445.8	46.7	
4. Semipalatinsk.....	32.2	64.1	23.6	224.6	67.6	
5. Semirechensk.....	59.0	46.7	65.9	303.3	47.1	
6. Sirdaria.....	45.0	24.9	37.9	350.3	22.7	
7. Turghay.....	43.0	43.2	16.4	204.1	51.5	
8. Ural.....	53.8	47.1	.....	260.8	56.2	
9. Fergana.....	51.7	.....	.....	315.8	.....	
Average.....	96,900 3,300 =29.1	20,703,800 431,200 =48.0	13,871,000 291,600 =48.3	274,000 6,200 =44.2	9,387,600 37,000 =253.7	17,999,300 367,300 =49.0

minimum, as the supply of fats in Siberia and Central Asia will be below the average in the first few years after the war. With a fat ration as given in Table 2, Siberia and Central Asia will consume 8,550,000 poods; butter cannot be counted upon in this quantity, as it is one of the most important items of export for Siberia, and a means of securing a foreign commercial balance. In normal times Siberia only consumed 5 to 7 per cent of her own butter, the production of which was about 5,000,000 poods in 1914. If we assume the same proportion for 1919, a minimum of 8,300,000 poods of vegetable oils has to be supplied to take the place of animal fats. Central Asia can meet the whole of this demand with cotton-seed oil. However, the necessary quantity cannot be guaranteed at present, owing to the decreased area in cotton in Central Asia, especially in the provinces of Fergana and Transcaspia. Owing to a reduction in the supply of bread cereals from without, the farmers of these regions were compelled to raise their own food stuffs.

### Flax and Cotton Raised for Their Oils

If we assume the average amount of fat obtained from the seed to be 15 per cent, we shall require 27,670,000 poods of flax and hemp seed in 1919, which does not include the cotton-seed oil expected from Central Asia, this latter oil constituting 50 per cent of the general oil consumption of Siberia and Central Asia.

Table 10 shows the average yield of seed and fiber for the period 1908-1912. The net yield of flax and hemp is assumed to be 20 poods seed and 25 poods fiber. These figures make it necessary to have a minimum area

of 1,383,500 dessiatines under flax and hemp in 1919, which would result in 35,000,000 poods of raw fiber, representing a great export value.

In order to simplify the calculations we give the area under other cereals in per cents, in addition to the data of Table 3. Thus we see that the whole cultivated area in 1919 should be at least 23,886,000 dessiatines, as per Table 11.

Furthermore, we should consider the loss of grain in transit, possible loss from fire, and a minimum allowance of 15 per cent for partial crop failure. Adding these, we arrive at a total cultivated area for Siberia and Central Asia of about 30,000,000 dessiatines in 1919, which can serve as a basis for further calculations. This figure is arrived at on the assumption that it is necessary to raise enough produce to allow of a satisfactory minimum food ration for the population of Siberia and Central Asia.

### Horsepower and Man-Power Required

What is the necessary amount of horsepower and manpower for the cultivating of this area?

The average depth of plowing in Siberia does not exceed  $4\frac{1}{2}$  in. It is hardly necessary to point out that this is not enough even under existing conditions. Taking as average draft in wheat stubble 5 lb. per square inch, the total draft for a 5 x 12-in. furrow would be 270 to 300 lb. In virgin gumbo soil, which will make up more than 50 per cent of the acreage under intensified cultivation, the total draft would be as high as 800 to 900 lb. per plow.

The average draft of a horse in plowing is equal to one-tenth of its weight, which latter for a Siberian horse amounts to about 900 lb. We would need three horses to pull a foot-list, beam-hitch sulky plow with steel plow bottom. But we have to take into consideration that the Siberian horse, though a very good and enduring runner, is not a good draft horse for general farm purposes, and therefore in Siberia or Central Asia one horse will be required to cultivate 10 dessiatines, or 27 acres for a year.

These figures show that 30,000,000 dessiatines under the plow in Siberia and Central Asia, with a draft 5 lb. per square inch, will require at least 3,000,000 horses, while over 6,000,000 horses will be required if 50 per cent of the 30,000,000 dessiatines is new-broken ground. The statistics for 1912 show\* that there were in Siberia and Central Asia 4,506,000 and 4,435,000 horses respectively. Of these 9,000,000 horses, probably 5,500,000 were used on the farm, the remainder comprising colts and breeding stock required to keep up the supply for

\*According to available data the absolute increase of horses throughout Siberia and Central Asia in 1912-1917 was negligible, owing to reasons which are not within the limits of this article. The number of horses in Siberia was 4,328,000 in 1908 and 4,506,000 in 1912; the number of horses in Central Asia was 4,602,000 in 1908 and 4,435,000 in 1912.

TABLE 6  
SIBERIA, 1918-19

Provinces	POPULATION IN 1918-19			TOTAL SUPPLY OF GRAIN					CULTIVATED AREA IN DESIATINES (APPROXIMATELY)	
	With Full Ration	With Half Ration	Total	For Full Ration 15 poods/y.	For Half a Ration 7.5 poods/y.	Total	Plus 15 per Cent for Next Sowing	Sum Total	1918-19.	1912
1. Amour.....	172,620	277,380	450,000	2,589,300	2,080,350	4,669,650	900,500	5,570,150	140,000	142,400
2. Eniseisk.....	718,690	781,300	1,500,000	10,780,350	5,859,750	16,640,000	2,500,000	19,140,000	500,000	356,300
3. Transbaikal.....	692,520	807,480	1,500,000	10,388,000	6,056,100	16,444,100	2,470,000	18,914,000	475,000	247,900
4. Irkutsk.....	758,730	741,270	1,500,000	11,380,950	5,559,525	16,940,475	2,540,000	19,480,475	500,000	253,100
5. Primorskaja.....	292,880	707,120	1,000,000	4,393,200	5,303,400	9,696,600	1,454,500	11,151,100	280,000	103,400
6. Tomsk.....	1,325,660	1,274,340	2,600,000	19,884,900	9,557,550	29,442,450	4,416,400	33,858,850	847,000	729,100
7. Tobolsk.....	2,786,545	2,963,455	5,750,000	41,798,175	22,225,912	64,024,100	9,603,600	73,627,700	1,840,000	1,822,100
8. Jacoutsk.....	450,000	.....	450,000	6,750,000	.....	6,750,000	1,012,500	7,762,500	194,000	.....
	14,750,000	.....	.....	107,964,875	56,642,587	164,607,462	24,897,500	189,504,775	4,776,000	3,654,300



TABLE 7  
CENTRAL ASIA

Provinces	POPULATION IN 1918-19			TOTAL SUPPLY OF GRAIN					CULTIVATED AREA IN DESSIATINES	
	With Full Ration	With Half a Ration	Total	For Full Ration 15 Poods/y	For Half a Ration 7.5 Poods/y	Total	Plus 15 per Cent for Next Sowing	Sum Total in Poods	1918-19	1912
1. Akmolinsk.....	935,000	965,000	1,900,000	14,125,000	7,237,500	21,362,500	3,204,375	24,566,875	614,172	593,700
2. Transcaspian.....	376,250	248,750	625,000	5,643,750	1,865,625	7,509,375	1,126,406	8,635,781	215,895	93,000
3. Samarkand.....	377,300	622,200	1,500,000	13,167,000	4,666,500	17,833,500	2,675,025	20,508,525	512,713	395,000
4. Semipalatinsk.....	709,200	390,300	1,100,000	10,633,000	2,931,000	13,564,000	2,034,600	15,598,600	389,965	185,200
5. Semirechensk.....	1,015,000	585,000	1,600,000	15,225,000	4,387,500	19,612,500	2,941,875	22,554,375	562,859	328,400
6. Sirdaria.....	1,464,000	986,000	2,450,000	21,960,000	7,395,000	29,355,000	4,403,250	33,758,250	843,956	483,900
7. Turgay.....	565,000	285,000	850,000	8,475,000	2,137,500	10,612,500	1,591,875	12,204,375	305,194	340,100
8. Ural.....	663,000	387,000	1,050,000	9,945,000	2,902,500	12,847,500	2,227,125	15,074,625	376,866	318,900
9. Fergana.....	1,505,000	1,170,000	2,675,000	22,575,000	8,775,000	31,350,000	4,702,500	36,052,500	901,312	258,200
	8,110,250	5,639,750	13,750,000	121,748,750	42,298,125	164,046,875	24,907,031	188,953,906	4,723,932	2,996,400

town and country, the driving horses and the idlers. Therefore, the available number of horses will hardly cover the requirements of intensified agriculture.

Let us now see how many laborers there are among the country population. By a fully efficient laborer we mean one between 19 and 50 years of age, and by a half-efficient one a laborer between 15 and 19 or between 50 and 55. From the whole country population we must exclude certain nomadic tribes (the kirgys, kalmyks, booriats, yakoots, bashkyrs, toongoos, etc.), to whom agriculture is almost unknown; these tribes number altogether about 8,750,000.

This gives an able agricultural population of about 13,111,800, among whom there are about 4,785,000 fully efficient laborers, men as well as women, and about 1,625,800 male and female half-efficient laborers. There will, therefore, be sufficient manpower to cultivate the 30,000,000 dessiatines.

### Modern Implements Lacking

It appears from the above figures that Siberia and Central Asia are in some respects in about the same state as the United States was in the 80's. There are, however, many points of difference, of which the chief one is the lack of up-to-date agricultural machinery. This must be introduced, together with the tractor. The experience of the United States shows that the horse cannot compete with the tractor, and that, on the other hand, the tractor cannot entirely replace the horse. The advantages of the tractor are of an entirely different character than those of a horse, namely:

(1) The tractor does such heavy work as would be entirely impossible for the horse, and can do it whenever it is most necessary, since it places at the command of the farmer, the co-operative society and the State a vast amount of power to be utilized at the proper season of the year. It is well known how important it is in agriculture to have certain kinds of work done at the proper time. The experience of the Bezenchok Agricultural Station in the province of Samara, Russia, proved this conclusively in 1911-1913, as far as the spring

sowing of wheat and oats is concerned, as appears from the following figures:

YIELD PER DESSIATINA IN POODS

YIELD PER ACRE IN POUNDS							
Day of Sowing	1911—DRY YEAR				Day of Sowing	WHEAT	
	WHEAT CROP		OATS CROP			Grain Poods	Straw Poods
	Grain Poods	Straw Poods	Grain Poods	Straw Poods			
April 13...	16.7	43.3	13.6	40.8	April 7...	96.6	200.4
April 30...	14.7	50.2	8.7	38.9	April 12...	86.6	179.0
April 25...	7.4	43.5	7.1	35.5	April 17...	58.5	133.3
					April 27...	35.6	107.3
					May 5...	25.6	50.7

In Siberia May 10 is the limit for drilling grain, with five to six weeks time previous to that for plowing.

(2) The ability of a tractor to plow to a good depth, especially in hot weather, and to work at night as well as by day. The joint use of the tractor and the horse allows the farmer to increase the cultivated area, and a detailed study of the requirements of Siberia and Central Asia shows that an increase on a large scale is the only way to supply these countries with sufficient food.

(3) The tractor is capable of many different kinds of work and raises the general efficiency of an agricultural unit; this is particularly true if we consider a machine with a two or three-speed transmission. The part of the tractor in other agricultural operations, such as reaping, threshing, transportation, etc., is no less important.

### Transport Facilities Must Be Developed

Besides the growing of grain, Siberia and Central Asia are looking forward to railroad construction and the development of other ways of communication on a huge scale. Enormous investments will be made for the erection of grain elevators, for the equipment of sugar refineries, factories for textiles and household articles, etc. To raise the money for such investments, Siberia and Central Asia must create a satisfactory balance in foreign trade, which can be accomplished only by placing her agriculture, and particularly the production of plants

TABLE 8  
SIBERIA

Provinces	BUCKWHEAT, MILLET			CULTIVATED AREA IN DESSIATINES (2.7 ACRES)		POTATOES			CULTIVATED AREA IN DESSIATINES	
	Full Ration 4.5 Poods/y	Half a Ration 2.25 Poods/y	Altogether in Poods	In 1919	1912	Full Ration 10.5 Poods/y	Half a Ration 5.25 Poods/y	Altogether in Poods * 36.1 Lbs.)	In 1919	1912
1. Amour.....	776,790	624,105	1,400,895	77,828	4,600	1,812,510	1,456,245	3,268,755	9,340	4,100
2. Eniseisk.....	3,234,105	1,757,925	4,992,030	277,340	8,900	7,546,245	4,101,825	11,648,070	33,280	13,700
3. Transbaikal.....	3,116,340	1,816,830	4,933,170	273,000	26,300	7,271,460	4,239,270	11,510,730	32,900	6,600
4. Irkutsk.....	3,314,285	1,660,857	4,975,142	276,300	5,700	7,966,665	3,891,665	11,858,332	33,580	8,100
5. Primorskaya.....	1,297,960	1,591,020	2,888,980	160,540	38,100	3,075,240	3,712,380	6,787,620	19,400	10,600
6. Tobolsk.....	5,965,470	2,867,268	8,832,733	380,000	2,800	13,919,430	6,690,285	20,609,715	58,885	17,700
7. Tomsk.....	12,539,452	6,667,778	19,207,225	1,067,700	64,000	29,248,720	15,558,140	44,806,860	128,200	58,700
8. Yakoutsk.....	2,025,000	.....	2,025,000	112,500	.....	.....	.....	.....	.....	.....
	32,269,402	16,985,778	49,255,180	2,736,210	.....	70,840,270	39,649,810	110,490,082	315,585	119,500



TABLE 9

Provinces	CEREALS BUCKWHEAT, MILLET, ETC.			CULTIVATED AREA IN DESIATINES (2.7 ACRES)		POTATOES			CULTIVATED AREA IN DESIATINES (2.7 ACRES)	
	Full Ration 4.6 pood/y	Half Ration 2.25 pood/y	Altogether in Poods	In 1919	In 1912	Full Ration 10.5 Poods/y	Half Ration 5.25 Poods/y	Total in Poods	In 1919	In 1912
1. Akmolinsk.....	4,207,500	2,172,000	6,379,500	354,416	9,400	9,817,500	5,066,250	14,883,750	59,535	18,100
2. Transcaspian.....	1,692,000	559,700	2,251,700	125,100	100	3,950,625	1,805,937	5,756,562	21,026	100
3. Samarkand.....	3,950,100	1,400,000	5,350,000	297,222	5,200	9,216,900	3,266,550	12,483,450	49,933	900
4. Semipalatinsk.....	3,191,400	879,300	4,070,700	226,150	37,400	7,446,600	2,051,700	9,498,300	37,993	2,700
5. Semirechensk.....	4,567,500	1,317,000	5,884,500	326,916	80,300	10,657,500	3,071,250	13,728,750	54,915	4,400
6. Sirdaria.....	6,588,000	2,218,500	8,806,500	489,250	86,900	15,372,000	5,176,500	20,548,500	82,194	3,300
7. Turgay.....	2,542,500	641,250	3,183,750	176,875	97,700	5,932,500	1,496,250	7,428,750	29,715	5,500
8. Ural.....	2,983,500	870,750	3,854,250	214,130	105,200	6,961,500	2,031,700	8,993,200	35,973	2,300
9. Fergana.....	6,772,500	2,632,500	9,405,000	522,500	12,100	15,802,500	6,142,500	21,945,000	87,780	2,500
	36,496,125	12,689,775	49,185,900	2,732,550	434,300	85,157,625	29,608,637	114,766,262	459,065	36,800

possessing an industrial value, such as cotton, flax, potatoes, beans, etc., on a more intensive basis.

The development of agriculture will constitute a serious task to the government of Siberia and Central Asia. It is not within the province of this article to consider in detail the possibilities of the future export trade of Siberia and Central Asia. But considerations of even a most general character lead to the conclusion that the population of Central Asia and Siberia, as per Table 1, needs more than 60,000,000 dessiatines of cultivated land to permit of a higher standard of living. This advancement will hardly be achieved unless tractors are introduced and the farms are equipped with modern implements generally.

We do not need to fear unemployment as a result of the use of machinery for farm work; any surplus of labor will find employment in the industries, especially in sugar refining, textile manufacturing, in the pulp, cellulose and paper factories. As far as the latter industry is concerned, the possibilities of Siberia are unlimited, and in connection therewith the tractor will prove of still greater importance, paving the way for more complicated machinery.

#### Possible Demand for Tractors

Let us see what would be the result if the agricultural work to be done in Siberia and Central Asia were done by means of tractors. We do not intend to make a comparison of various kinds of tractors. But it is clear that a 3-plow tractor with 15-30 b.h.p. engine would be the most suitable one for Siberia and Central Asia. With a 7 x 14-in. furrow and an average speed of 2½ m.p.h., the average draft being 7¾ lb. per sq. in., the tractor will plow 1 dessiatina in 3 hours, which makes 300 dessiatines in the 900 hours of the yearly plowing time. For the necessary minimum of 30,000,000 dessiatines a year 100,000 tractors would be needed; considering that the average life of a tractor is 5 years, Siberia and Central Asia would need 20,000 new tractors yearly. There would be yearly requirements of 50,000,000 poods of kerosene (about 7 gallons per dessiatina), about 120,000 poods lubricating oils and about 750,000 poods of heavy grease for the gear box.

As soon as normal conditions are restored there will be no great difficulty in supplying these quantities to Siberia and Central Asia from Baku by way of the

Caspian Sea, Volga River, Oural River, etc. On the other hand, eastern Siberia can be supplied with kerosene from Baku via Batoom, the Black Sea, etc., to Vladivostok.

With regard to the present and the immediate future the horse undoubtedly has the advantage over the tractor, owing to the exorbitant cost of kerosene and lubricating oils. But this will all be changed as soon as Siberia and Central Asia introduce industrial agriculture, producing vast quantities of cotton, flax, hemp, vegetable oils, animal fats, alcohol, sugar, etc. We may say with perfect assurance that only by means of tractors will it be possible for Siberia and Central Asia to treble in the next 10 years their cultivated area and thus to create for themselves a favorable export balance. It is clear, also, that Siberia and Central Asia must develop their smaller industries, out of political and economical consideration, in order to make the population spend the idle winter months in an efficient way. These industries include timber work, spinning, weaving, milling, dairying, soap making, etc., all of which can be established and organized permanently only with the aid of tractors.

The introduction of tractors in Siberia and Central Asia can be accomplished only by means of a comprehensive plan of work, a well-organized credit system, and—what is still more important—a previously developed campaign of tractor propaganda on well-equipped experimental farms and small shops.

Assuming that in the beginning Siberia and Central Asia were supplied with only 10 per cent of the whole number of tractors they will eventually need, this would call for about 2000 tractors.

Tables 12 and 13 show the agricultural characteristics of the different provinces of Siberia and Central Asia, and also contain data concerning the cultivated area in 1912.

#### Conclusions

(1) The introduction of tractors, together with improved agricultural machinery and industrial tools, is absolutely necessary to promote industrial agriculture and the smaller industries in Siberia and Central Asia.

(2) It is necessary to organize, during the next 3 years, a widespread propaganda of tractors. For this purpose there should be established a number of experimental stations in the shape of farms under the management of capable instructors. At first they should be established in the provinces of Tobolsk, Tomsk, Akmolinsk, Amur and Primorskaya, but later on the net of experimental farms and model industrial units, together with repairshops, should be extended as far as possible.

(3) Stores of fuel and other supplies necessary for the efficient operation of tractors should be established; there must also be a completely developed and practical plan for supplying the farmers with these materials.

(4) Special banks should be opened, a bank of agriculture and a bank for small industries, offering liberal

TABLE 10

Year	SIBERIA				CENTRAL ASIA			
	FLAX		HEMP		FLAX		HEMP	
	Seed	Raw Fibre	Seed	Raw Fibre	Seed	Raw Fibre	Seed	Raw Fibre
1908.....	30.0	30.8	42.7	29.9	28.5	28.7	35.5	29.8
1909.....	25.1	22.1	30.9	27.3	22.9	22.0	24.4	29.7
1910.....	25.6	24.0	28.9	27.5	23.8	22.3	31.8	34.9
1911.....	22.0	19.4	29.0	21.6	17.2	14.1	23.8	20.8
1912.....	26.6	32.8	28.7	33.2	24.9	26.1	26.4	34.5

TABLE 11

1918-19	Wheat and Rye	Barley	Buckwheat Millet	Oats	Flax and Hemp	Potatoes	Kitchen Garden (Country)	Cotton	Total in Dessiatines (2.7 Acres)
Siberia.....	4,800,000	410,000	2,750,000	3,950,000	1,400,000	316,000	100,000	.....	13,026,000
Central Asia.....	4,750,000	750,000	2,750,000	950,000	.....	460,000	100,000	400,000	10,860,000
	9,550,000	1,160,000	5,500,000	4,900,000	1,400,000	776,000	200,000	400,000	23,886,000

TABLE 12  
SIBERIA. CULTIVATED AREA IN DESSIATINES (2.7 ACRES), 1912

Provinces	Wheat	Rye	Oats	Barley	Buckwheat	Millet	Flax	Hemp	Potatoes	Peas Lentils	Total
1. Amour.....	139,700	4,700	141,400	1,600	2,700	1,900	300	500	4,100	100	295,000
2. Eniseisk.....	143,600	212,700	110,700	15,400	4,000	4,900	2,700	5,400	13,700	1,200	514,300
3. Transbaikal.....	53,800	194,100	54,200	11,200	26,100	200	.....	.....	6,600	600	346,800
4. Irkoutsk.....	47,300	205,800	83,200	21,100	4,900	800	400	3,200	8,100	1,400	376,200
5. Primorskaya.....	92,100	11,300	83,100	6,600	31,000	7,100	4,200	1,100	10,600	500	247,000
6. Tobolsk.....	561,200	167,900	350,400	32,500	900	1,900	13,200	6,300	17,700	2,800	1,155,300
7. Tomsk.....	1,564,400	257,700	897,600	92,300	24,600	39,400	34,400	39,200	58,700	17,200	3,025,500
8. Jakoutsk.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	2,600,100	1,054,200	1,720,600	180,100	94,200	56,200	55,200	56,200	119,500	23,800	5,960,100

TABLE 13  
CENTRAL ASIA. CULTIVATED AREA IN DESSIATINES (2.7 ACRES), 1912

Provinces	Wheat	Rye	Oats	Barley	Buckwheat	Millet	Flax	Hemp	Potatoes	Peas Lentils	Cotton	Total
1. Akmolinsk.....	587,600	6,100	96,700	24,300	600	8,800	18,700	1,800	15,200	1,100	.....	761,400
2. Transcaspian.....	93,500	.....	.....	8,000	.....	100	.....	.....	100	.....	43,400	145,600
3. Samarkand.....	369,700	26,200	1,800	66,100	100	5,100	24,900	700	900	6,100	31,600	533,200
4. Semipalatinsk.....	178,600	6,600	56,000	10,700	200	37,200	1,100	500	2,700	1,900	.....	295,500
5. Sirdaria.....	473,600	10,300	23,000	56,800	1,100	85,800	11,700	3,100	3,300	6,800	62,400	737,900
6. Turgay.....	322,000	18,100	43,200	16,900	400	97,300	10,000	600	5,500	300	.....	514,300
7. Semirechensk.....	320,900	7,500	122,600	86,300	500	79,800	3,200	1,400	4,900	2,500	.....	629,600
8. Ural.....	244,600	74,300	20,400	4,000	.....	105,200	.....	.....	2,300	.....	.....	450,800
9. Fergana.....	258,100	100	3,700	17,400	300	12,100	8,300	.....	2,500	3,800	264,500	570,800
	2,848,600	149,200	367,400	291,500	3,200	431,400	77,900	8,100	37,400	22,500	401,900	4,639,100

credit to farmers who desire to introduce tractors on their farms or to establish small factories and mills for manufacturing various kinds of ready-to-use goods and articles from local raw materials. The power of these banks should be widened so as to entitle them to exercise control over the choice of grains to be sown, and over the exportation of agricultural produce and manufactured articles from Siberia and Central Asia. To successfully accomplish this it is necessary for the promoters to establish close relations with the Siberian co-operative companies and with the local government.

(5) Much patience will be needed, as no considerable returns can be expected until the whole trading system of Siberia and Central Asia can be put into shape, which will require about 5 years of hard work. By that time

the agriculture of these countries will be placed upon a substantial footing.

(6) A well-conceived and well-elaborated policy, firmly adhered to, in full accord with the mass of the population of Siberia and Central Asia, is the only means of taking advantage of the immense opportunities for the tractor in these countries, and later on in European Russia and Caucasia.

(7) Haphazard industrial intervention, based on selfish interests only, would introduce into these countries machinery of questionable quality. If this should happen the future of the American tractor in that part of the world could very easily be ruined, which would be a most unfortunate thing, considering the great advantages of the best makes of American tractors.

## Automatic Variable Speed Generator

THE Harvey-Taeubert Mfg. Co., Los Angeles, Cal., recently formed for the purpose of manufacturing electrical specialties, will soon place on the market a new automatic variable speed generator, designed to maintain a substantially constant flow of current under variable speed. This generator is specially suited for use on motorcycles and automobiles. It is of standard form, but is made in two types, one for use without a battery (on motorcycles and trucks), and the other for use with a battery. The latter type is provided with a cut-out switch, which is enclosed in the generator housing, so that the whole forms a single unit.

The minimum speed required to produce full load is very low for this type of apparatus, viz., 1200 r.p.m. armature speed, which with a gear ratio of 2 to 1 corresponds to 600 r.p.m. engine speed.

The regulating mechanism is mounted as a unit directly above the generator proper, and is enclosed. It comprises a ball governor and an auxiliary commutator. The motion of the balls under the centrifugal force serves to actuate brushes

connected with the commutator for regulating resistance connected therewith, according to the speed of the armature shaft. The auxiliary commutator is stationary, and of internal contact design. It is of improved wedge construction, with the resistance mounted on its periphery. Should it become necessary to resurface the commutator, the whole unit can be easily removed. The wiping action of the brushes, rocking as the speed is increased or diminished, has a tendency to polish both the commutator and the brushes. As no voltage is generated between bars under the brushes in the regulating means, no sparking occurs. A speed variation of 5 to 1 may be taken care of.

We are informed that the generator has been thoroughly tested, and that applications for a patent on it have been filed. It was designed by E. E. Taeubert, who was the organizer of the A-B-C Generator Co., now well known in the motorcycle field.

The Harvey-Taeubert Mfg. Co. is located at 633-5 S. Los Angeles Street, Los Angeles, Cal.



# Dixie Standard Aircraft Magneto

A Few Extra Parts Permit of Converting an 8-Cylinder 90-Deg. V Engine Magneto Into One for Almost Any Other Type of Aircraft Engine—Methods Used in the Manufacture of Magneto Magnets

A GREAT opportunity offered itself to magneto manufacturers at the outbreak of the war in connection with the development of ignition apparatus for aircraft engines. Pre-war aircraft invariably carried magnetos and as Germany had been the main source of supply of these machines, the demand upon manufacturers in allied and neutral countries increased enormously with the outbreak of hostilities. American manufacturers were perhaps better prepared to take care of this demand than manufacturers in England and France, not only because of their much larger facilities but also because they already had had experience in producing magnetos for multi-cylinder automobile engines. It is no wonder therefore that our magneto concerns secured considerable European business from the very beginning of the war.

Among the American concerns which have been most active in the development of magnetos for aircraft engines is the Splitdorf Electrical Co. of Newark, N. J. It has furnished its Dixie magnetos in large numbers for Hispano-Suiza, Curtiss, Le Rhone, Hall-Scott and Bugatti engines built in this country and it has also supplied smaller numbers for other makes of engines. The special achievement of the Splitdorf engineering department in connection with aircraft work is the production of a standardized line of magnetos so that by the use of only sixteen extra parts the standard magneto for eight-cylinder engines can be converted into six other models covering practically the whole range of aircraft engine types.

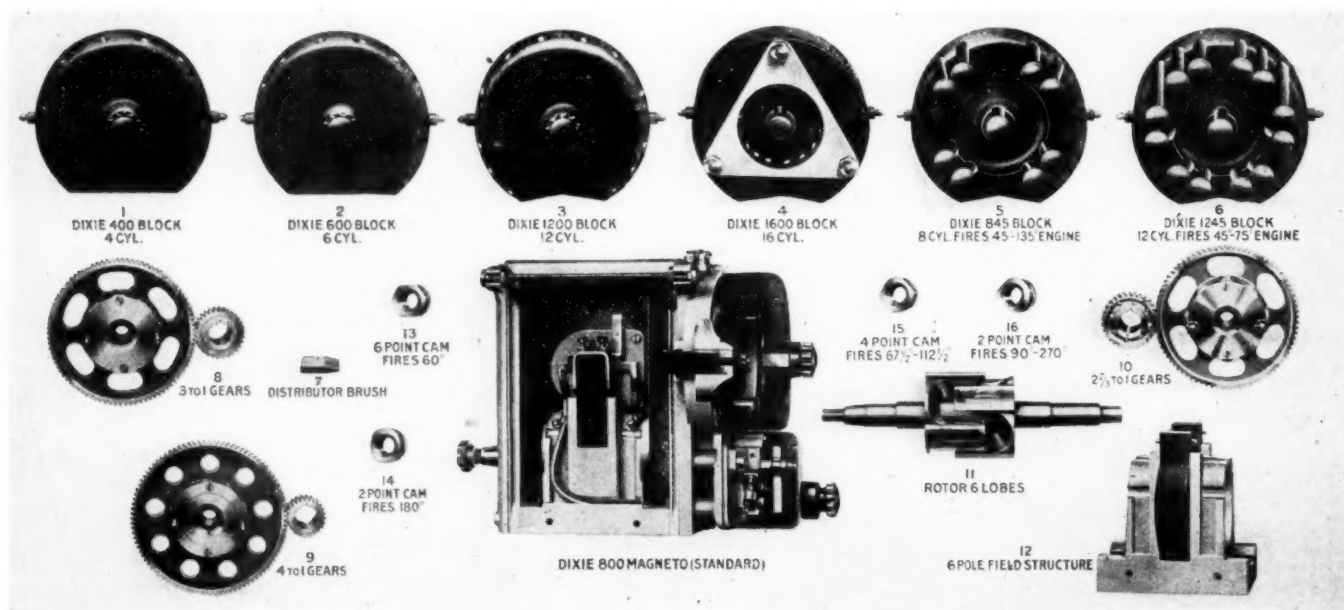
The demand for aircraft magnetos confronted ignition experts with a number of distinct problems. In the first place the magneto must be absolutely reliable. There

must be nothing on it that can break or shake loose in spite of the terrific vibration on an aircraft engine. Next, the machine must be light, as every pound of additional weight detracts from the speed, climb and ceiling of the machine and reduces its fighting value by just so much. Finally, it appeared at the outset that a great variety of types of engine would be used for different classes of planes, and as it was essential to get into production quickly it was necessary to adopt a single general design to different types of engines with the least possible number of changes. This the Splitdorf company set out to do and how well it has succeeded may be judged from the following description of the Dixie line.

Generally speaking, the Dixie aircraft magneto is of the same type as the automobile magneto of the same make. It operates on the distinctive Dixie principle without revolving windings and its magnets straddle the rotor lengthwise instead of transversely. However, before going into details of construction it will be best to explain how the single design of magneto is adapted to the different types of engine, as the solution of this problem forms the Splitdorf company's chief contribution to the carrying out of our aircraft program.

## Eight Cylinder the Basic Type

The basic type is the eight-cylinder 90-deg. V, the earliest as well as the greatest demand having been for magnetos for such engines. The eight-cylinder 90-deg. V Dixie magneto has a four-wing rotor, in which respect it differs from the Dixie magneto for four- and six-cylinder automobile engines which has a two-wing rotor. This eight-cylinder aircraft magneto generates four im-



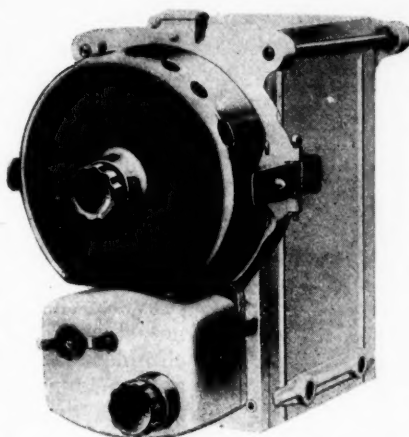
Dixie eight-cylinder magneto and extra parts required to convert it into six other models



pulses per revolution, exactly the same as the number of sparks required by the eight-cylinder engine. Also, with a 90-deg. V the sparks must come at equal intervals, as do the impulses of the magneto. The distributor gearing is the usual 1:2 gearing, the distributor having eight equally spaced contact segments all in a single circle.

Four-cylinder engines have been used to quite an extent for training planes and this is the smallest number of cylinders to which the magneto has been adapted. The four-cylinder model is very much like the eight-cylinder one, only two extra parts being required to convert the latter into the former. One of these is the distributor block, which has only four contact segments instead of eight, and the other is the breaker cam. As the magneto is driven at crankshaft speed and has the same magnetic circuit arrangement as the eight-cylinder model, four electric impulses will be generated per engine revolution, whereas only two sparks are required per revolution. The four-cylinder magneto is driven at the same speed as the eight-cylinder model, and every second current impulse is simply suppressed, by so constructing the breaker cam as to hold the primary circuit open during every second impulse. The type of cam used is illustrated herewith. It has two oppositely located lobes which cause the circuit to open at moments corresponding to the peaks of alternate inductive impulses and holds the primary circuit open during the period of the intermediate or unessential impulses, thus preventing the production of a spark during these intervals.

Next comes the six-cylinder model, which requires a different distributor block, a different cam and a different set of distributor gears as compared with the eight-cylinder model. In order to produce three sparks per revolution of the crankshaft, the rotor is driven at one and a half times crankshaft speed, thus insuring the production of six sparks per two engine revolutions, of which every other one is suppressed by means of the breaker cam. This breaker cam is the same as that used for the



*The eight-cylinder magneto complete*

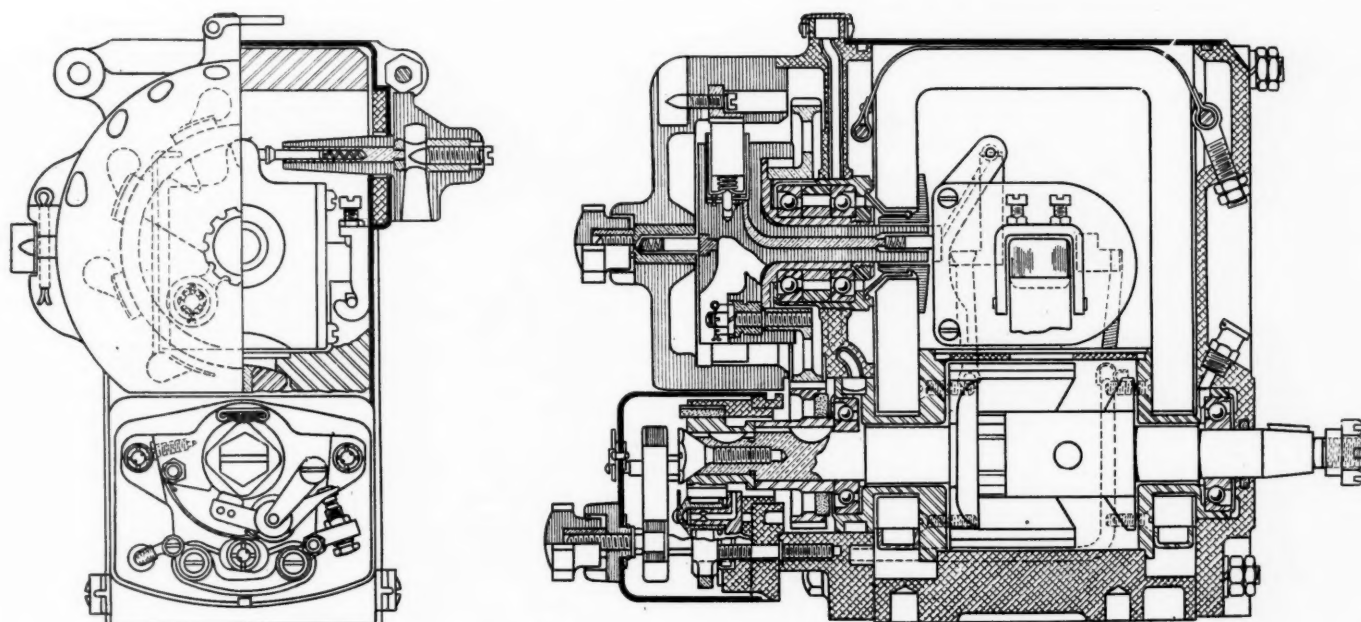
four-cylinder magneto. It is obvious that the high tension distributor must run at one-half crankshaft speed, and since the rotor is geared to run at one and one-half times crankshaft speed, the distributor gearing must give a speed reduction of 3 to 1.

No particular difficulty is encountered in adapting the magneto to the ignition of twelve-cylinder, 60-deg. V engines. Running it at one and one-half times crankshaft speed results in the production of six impulses per revolution, equal to the number of sparks required, and as they are evenly spaced, the sparks come in the correct order for firing an ordinary twelve-cylinder engine. The gears used, therefore, are 3 to 1. On account of the necessity of maintaining a space at

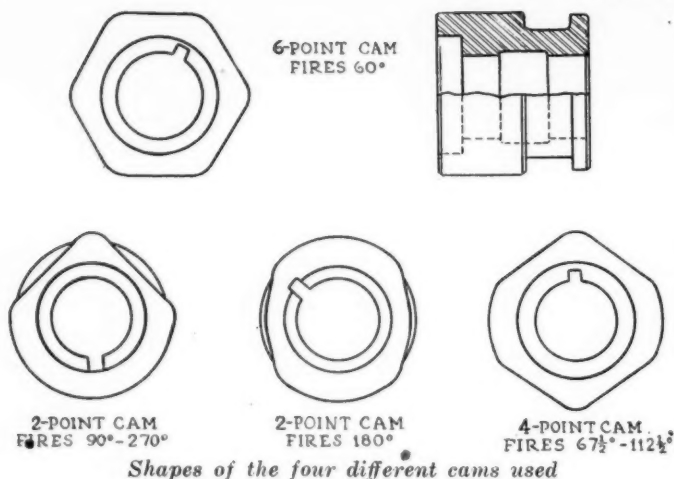
least  $\frac{1}{2}$  in. between distributor segments, a narrower distributor brush is used.

#### Special Field Structure in 16-Cylinder Type

For use on a sixteen-cylinder engine with equally spaced explosions, such as the Bugatti, the magneto is driven at one and one-third times crankshaft speed, and a special type of field structure and rotor are used. The rotor has six wings, so that six impulses are induced in the armature winding during each revolution. Rotating at one and one-third crankshaft speed, the number of impulses is equal to eight per crankshaft revolution, and to sixteen during two crankshaft revolutions or one complete cycle of the engine. Forming the rotor with six wings makes the individual wing comparatively narrow, and would result in an inadequate pole surface if the field pole masked only one wing at a time. Therefore, the field structure is so made that each field pole masks at the same time two of the wings of one rotor pole. In this way the effective gap area is even larger than with the four-wing rotor, and the magnetic flux is increased. This magneto also requires a special distributor block with 16 contact segments, special distributor gears giving a reduction ratio of  $2 \frac{2}{3}$  to 1, a special cam with six equally spaced cam lobes, and the same narrow dis-



*Longitudinal and cross section of Dixie aircraft magneto*



tributor brush as used in all of the multi-cylindered types.

The first Liberty aircraft engine ever built was an eight-cylinder 45-deg. V, and the Splitdorf company developed a magneto model for this. In an engine of this type the explosions do not come at equal intervals, but at intervals of 45 deg. and 135 deg. of crankshaft motion, and the sparks must be similarly timed. This requires a special distributor block with contact segments arranged in four pairs, the angular distance between the contacts of each pair being 22½ deg. The rotor is driven at twice crankshaft speed. In this model the ordinary rotor with four wings is used, which is capable of producing four impulses per revolution. Hence, eight impulses are produced per crankshaft revolution, or one impulse every 45 deg. Of these, two succeeding impulses are utilized for the production of sparks, and the next two impulses are suppressed. This requires a special cam, which opens the circuit at 90 deg. and 270 deg. intervals of its revolution. The brush used in the distributor of this model is of the narrow type, as the two contact segments of a pair are very close together.

#### Liberty Engine Model

The last model of the set is that for twelve-cylinder, 45 deg. V engines, such as the Liberty 12. This model has the special six-wing rotor and corresponding field structure, and as it is operated at one and one-half times crankshaft speed, it generates nine impulses per crankshaft revolution. In a twelve-cylinder, four-cycle engine there are necessarily six explosions per revolution, or one explosion every 60 deg. of crank motion. If the two sets of cylinders are set at an angle of 60 deg. the explosions will be equally spaced. If the angle of V is less than 60 deg., the shortest interval between explosions is equal to the angle of V, and the longer interval is equal to 120 deg. minus the angle of V. In the case of the twelve-cylinder 45 deg. V engine, the intervals between explosions are 45 and 75 deg.

As the rotor is of the six-wing type and rotates at one and one-half times crankshaft speed, it induces nine impulses per revolution, or one impulse every 40 deg. Of these two successive impulses are used, and then one impulse is suppressed. This makes the spacing of the peaks of the utilized impulses 40 deg. and 80 deg. However, it is not necessary to interrupt the primary circuit exactly at the moment of maximum induction in it, and by sometimes interrupting it immediately before the moment of maximum induction, and at other times immediately after the maximum induction, the intervals between sparks can be made 45 and 75 deg. instead of 40 and 80. The breaker cam used on this magneto has four cam lobes, the "opening" edges of which are 67½ and 112½ deg. apart. These

angular displacements of the cam edges, it will be noticed, are equal to one and one-half times the angular intervals between explosions, this multiplying factor depending upon the multiplication of rotor speed as compared with the crankshaft speed.

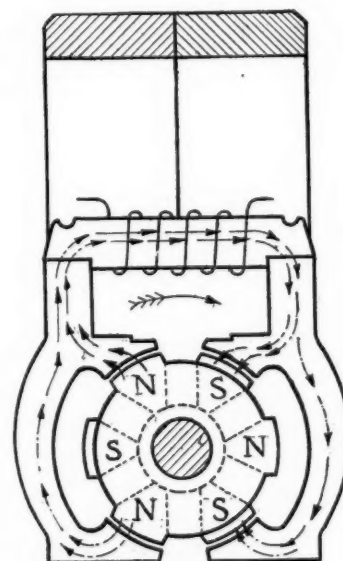
#### Manufacture of Magnets

Considerable improvement in the composition of magnet steel has been made in recent years, and the Splitdorf Electrical Co. claims that the magnets of its magnetos will not lose their strength within the life of the magneto provided the magnets are not removed and abused. Magnet steel is rather expensive material, and in order to eliminate waste, the bars are ordered in lengths which are exact multiples of the length of the individual magnets. After having been sheared off to the correct length, the bars are heated and bent to U form by means of a bulldozer. While still hot, they are inspected for shape by means of gages, and corrected, if necessary. Next they are accurately ground to shape and the holes for the armature shaft to pass through are punched. Then they are heated and quenched and subjected to a magnetizing process by being inserted into a double magnetizing coil through which a powerful current is sent momentarily by means of a switch.

There is one magnet, known as a master magnet, in the magnetizing coil, and the magnet to be magnetized is placed with its poles against those of the master magnet, so that the two together form a closed magnetic circuit. After the magnetization has taken place the pair of magnets are drawn to one side so that the newly magnetized magnet is entirely out of the coils, and a keeper is placed over its poles on the side, as shown in the sketch herewith. This keeper remains in position until the magnet is assembled on the magneto and the rotor is in place, which latter practically completes the magnetic circuit. The writer was informed that this precaution of never opening the magnet circuit from the time the magnet is magnetized till the magneto is assembled would be of no use with ordinary forms of field structure, as with these the armature reaction when the magneto is in operation causes a greater weakening of the magnetism than leaving the magnets open-circuited. In the Dixie magneto, owing to the comparatively high leakage factor of the magnetic circuit through the armature coil, the armature reaction is less pronounced. Tests made show that the reduction in field strength caused by armature reaction, after the magneto is first put in operation, is only about 5 per cent in the Dixie.

#### Testing Magnets

The aging process, formerly largely employed in the manufacture of permanent magnets, has been done away with, but each magnet, after it is withdrawn from the magnetizing coil, is subjected to a checking test to determine its magnetic strength. The apparatus employed in making this test consists of an exploring coil of rec-



Six-winged rotor and corresponding field structure. Each field pole masks two rotor wings



tangular shape, which is connected to a slow period ballistic galvanometer of the mirror type with damping feature. The light from the lamp used in connection with this galvanometer is reflected by the mirror onto a scale directly above the coil into which the magnet is inserted, and directly in front of the operator.

The operator introduces the magnet into the coils so that the latter is interlinked with the entire flux, and then withdraws the magnet with a smart motion. In this way all of the lines of force extending from pole to pole of the magnet are cut by the coil, and as the moving system of the galvanometer has a very slow period, the indication which it gives is directly proportional to the total quantity of electricity induced in the coil by withdrawing the magnet from it—in other words, to the flux of the magnet. In fact, the scale of the instrument is graduated so as to indicate directly the total number of lines of force of the magnet. A certain minimum flux corresponding to 60 C. G. S. units of coercive force is required with each type of magnet, and if a magnet shows less than this, it is scrapped. After the magnets have passed this test, they are placed in storage, but before they are assembled in the magnetos, they are recharged once more.

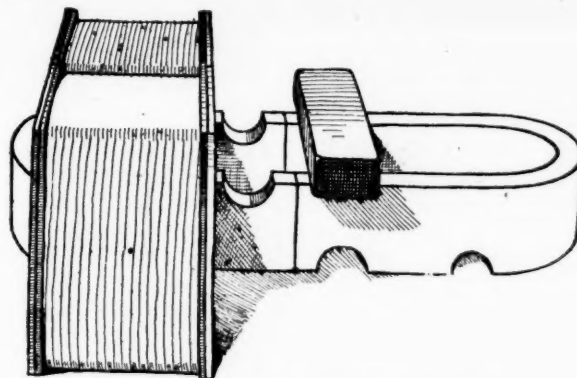
#### Structural Details

The end plates and base of aircraft magnetos are made of aluminum castings, and are held together by collar screws turned from the solid. The magnets fit snugly into this assembly of base and end plates, and are held rigidly in place by means of a steel strap which is hinged to one of the end plates and secured to the other one by means of an eye bolt. All screw connections are locked by the use of split washers, nuts and lock nuts.

The breaker is the regular Splitdorf type, and comprises a breaker arm of somewhat irregular shape. In order to facilitate the manufacture of this arm, the company makes use of extruded bar stock of a section similar to the breaker arm, which is sawed off to the thickness of the arm and then milled to lighten it. All magneto-fired aircraft engines use fixed ignition, and it is not necessary to mount the interrupter on a rocking base. This, of course, simplifies the construction. The absence of any need for variable timing also simplifies the design of the distributor. For services in which allowance must be made for considerable variation in the spark timing, the distributor segments must be of greater length circumferentially, and it is impossible to get more than six segments in a single circle. Distributors for eight and twelve-cylinder engines are then made with the segments arranged in two circles, side by side. With fixed spark the distributor contact segment can be made very short or narrow, and any number up to sixteen can be placed in a single circle.

#### Gap Type Distributor

In four, six and eight-cylinder magnetos the Splitdorf company has been using the regular brush type of distributor, because in the early part of the war the Government insisted upon adherence to this time-tried construction. In magnetos for twelve and sixteen-cylinder engines, the so-called open gap distributor is used, which will eventually be made the standard for all models. In this the revolving distributor brush is replaced by a revolving pin, and the distributor segments, instead of being turned down flush with the insulating material, slightly protrude from the insulation, and have a serrated formation of their sparking surface. This, as is well known, tends to facilitate the ionization of the air, and the breaking down of the air gap by the electromotive force.



*Dixie' method of magnetizing magnets*

For its aircraft magnetos, the company has been using a special insulating compound of its own, known as Americanite, which has a rubber base. One of the advantages of this compound is that it forms a very smooth track for the distributor brush. Besides it has a very high mechanical and dielectric strength.

Most of the aircraft magnetos which have been manufactured by the Splitdorf company are provided with a trailing brush in the distributor, which allows of starting the engine by means of a hand-operated high tension magneto. Connection from the hand magneto is made to a terminal at the center of the distributor block, which connects through a carbon brush and central contact on the distributor plate to the trailing brush. The connection from the high tension winding of the service magneto to the regular distributor brush is made on the opposite side of the plate, as clearly shown in the sectional view.

The advantage of the hand-operated magneto is that the engine may be turned over a couple of times by means of the propeller with the switch off, the operator then returning to his seat, throwing on the ignition switch and giving the hand magneto a turn, which produces a shower of sparks at the plugs insuring easy starting. This obviates any danger from the propeller.

#### British Aeronautical Society's Lectures

FOR the coming winter the Royal Aeronautical Society of Great Britain has arranged an interesting program of lectures. With the exception of three special lectures, the opening, popular and juvenile lectures, the subjects will be of scientific and technical character. Following is the list of the lectures, with the names of the lecturers and the dates: Shop Practice in Respect to Aircraft Steels, by Brig. Gen. R. K. Bagnall-Wild, Dec. 5; Civil Aerial Transport, by Claude Grahame-White, Dec. 11; Full Scale Aeroplane Experiments, by Capt. W. S. Farren, Dec. 18; To Constantinople and Back by Aeroplane, F. Handley Page, Jan. 8; Medical Aspects of Aviation, by L. E. Stamm, Jan. 15; Rigging of Aeroplanes, by Capt. R. J. Goodman-Crouch, Jan. 29; Fabrics and Dope, by F. W. Aston, Feb. 12; Points on Aeroplane Design, by Capt. F. S. Barnwell, Feb. 26; From Model to Full Scale in Aeronautics, by H. Levy, March 12; Lighter Than Aircraft, by Lt. Col. T. R. Cave-Brown-Cave, March 26; Aluminum Alloys for Aeroplane Engines, by Prof. T. C. Lea, April 26. The Wilbur Wright lecture will be given in May, and the annual general meeting of the Society will take place on March 19.

THE average production of benzol per ton of coal is in the neighborhood of 2½ gal. Seventeen and a half million tons of coal are at present being carbonized in Great Britain in recovery ovens, and this should accordingly yield approximately 44,000,000 gal. of benzol in the crude form.



# Co-ordination of Legislative and Operative Functions in Labor Essential to Success

By Harry Tipper

**EDITOR'S NOTE**—*The second part of this series, beginning with this article, will deal with the organization fundamentals and changes, as well as the newer experiments in organization and their advantages. Consideration will be given to the different industrial problems of organization.*

**I**N all group organizations established for whatever purpose by human beings, whether social, political, or industrial, for general or specific purposes, the functions required for the orderly progress of the organization divide themselves into the legislative and the operative.

In the earlier forms of organization where the necessities of operation were few, and consequently the necessity for legislation correspondingly simple, the same machinery could be made to serve both purposes. But the functions remain separate.

The operative functions require continuous decision, supervision and obedience to that supervision. They require the lodgment of large powers in the governor or leader, and an equally large measure of acquiescence in those who are subject to the government.

The legislative functions, on the other hand, dealing with those matters of rule and regulation and agreement by which the group shall remain in orderly co-operation depend for their permanency upon discussion, upon examination of all the possibilities, and upon agreement as to the conditions.

It is obvious, of course, that the operative functions represent the paramount necessity of any organization of human beings. It is necessary that all the operations of life should continue unless life itself is to cease.

But where the individual of the group depends for a part of his living upon the operations of other members of the group, the legislative necessities are of similar importance.

The legislative functions of the groups of Scandinavians who operated together under one leader in their first descent upon the British coast were easily disposed of by a meeting of all the free men of the group once a year, and the operative functions were started by the selection of a leader, and the oath of obedience to him.

In the early industrial groups where the numbers were small and the requirements of the group very simple, a few rules and regulations were easily disposed of between the leader and his subordinate, without the necessity of creating special machinery for the purpose, or without the necessity for constantly reviewing and adjusting the conditions.

## Military Type of Organization

This type of organization, the military type, as it might be termed, remains in essentials the usual type of industrial organization to-day. The necessities of industry and industrial groups have become more and more complicated; the groups themselves have become

larger and larger, and the questions for adjustment in the rules and regulations have occupied a corresponding increase of time.

While therefore the military system of organization remains essentially the usual system in industrial affairs to-day, other organization efforts have grown up outside the industrial unit in the attempt to provide for these increased legislative necessities, and at the same time permit the necessary efficiency in operation.

Unquestionably the operative function of an industrial organization requires a system which should in its character approach the military, and to this extent, and for this purpose, the customary industrial organization is the correct one.

The industrial difficulties have arisen from the fact that the purely military system of organization has no machinery with which to take care of the legislative functions; which cannot be separated from the operations of group organizations, and which become more and more important as the groups become larger, and their common co-operation more necessary.

It is this lack of legislative machinery which has given rise to the labor organizations, the worker attempting to secure through his occupational group the legislative powers which have been denied him in the individual industrial unit with its military form of organization.

## Growth of Industrial Organization

In order to illustrate this fundamental difficulty it is important to consider the growth of the industrial organization since the beginning of the industrial revolution, and the strength and weaknesses which have developed along with that growth.

In the beginning of the industrial revolution, about a century ago, very few establishments maintained over fifty workers; the large majority of them maintained less than ten workers under one roof.

Under these circumstances all questions relating to the condition of work, the hours of work, the value of the labor, and other matters of regulation were easily disposed of by the complete understanding between the members of such a small group and by the endless opportunities for the maintenance of that understanding.

The employer and the worker were very close together socially as well as economically, and the necessity for obedience in operation was accompanied by a confidence and understanding in regulation which made it possible to perform all the functions of the organization with this simple machinery.

As the machinery of production grew in quantity, in size and in skill, it became possible to concentrate in one industrial unit larger and larger groups of workers, following different occupations, and having somewhat different necessities in regulation and agreement.

These larger organizations did not change the system, but simply amplified the operating machinery of industrial government, so that the number of supervisors was

constantly increased, new officials were interposed between the worker and the employer or leader of the industrial unit, and the distance between the worker and his ultimate chief became greater.

This meant that the former understanding which existed between the leader and his employees was destroyed because of the lack of common interest and direct contact. The possibility of discussion did not exist in this larger organization, and the rules and regulations were promulgated by the owners or employers without either understanding or agreement.

In the political organization at the same time these legislative functions had been developed by the use of special machinery until they offered the individual an opportunity to share in the discussions and to agree with the regulations and requirements. In the industrial group, however, no machinery of the kind had been permitted, and very little modification has occurred even up to the present.

The position of the worker depended upon the attitude of his immediate supervisor, and his tenure could be ended by any conflict with his foreman. No matter what hardship a rule or regulation might inflict, there was no review of the matter, and there was no escape from its burdensome obligation. Some of the systems of penalties which obtained even up to 20 years ago are sufficiently indicative of the failure of the operating type of organization to meet the increasing legislative necessities with justice and discernment.

In the last 20 years the demands of the worker and the very necessities of efficient operation have compelled some important modifications in the military type of organization used in industrial work.

It has become usual in many lines of industry for a special department to hire men and to fit them for their work. There are many organizations where a man cannot be fired by his immediate superior until the case has been investigated in some other way. In a number of organizations the employee who is discharged has the right to demand a review of his case before a body composed of men other than the ones interested, while the establishment of the conference system among the heads of various departments suggests the beginning of special machinery for the performance of the legislative functions.

Even from an operative standpoint, however, the practice which has been usual in the development of the industrial organization has neglected to satisfy the demands of efficiency in some important particulars.

#### Knowledge of Human Nature Needed

To maintain the highest productive efficiency per man and to keep up a spirit of contentment, it would seem that some knowledge of human nature would be required of a supervisor; yet it has been customary in all industries to promote the man for his knowledge of the product and not for his knowledge of the producers. It is rare indeed, even to-day, in an examination of industrial organization to find any special attempt to discover the capacity of the prospective supervisor to understand and govern human beings.

These failures have induced a lack of faith in the present type of industrial organization, not only in the minds of the general body of the workers, but in the minds of many of those who must take part in the government of the operations. The failure is apparent even where the reasons for it have not been thought out.

In all operating organizations of the military type as they grow in size there is a distinct tendency to the development of a bureaucracy, so that precedent, custom and usual methods of examination and operation become

paramount. The rule is no longer a means to an end, but an end in itself.

The writer well remembers a case in a large industrial organization where the question of the disposition of a charge from one department to another took about 6 months' time, a voluminous correspondence, and several meetings of the parties concerned before it was adjusted.

The classic illustration of the disposition of a charge of 12 cents not accounted for by a soldier, which kept an array of clerks corresponding, sorting and filing for 3 years, and even came to the attention of several generals, is not without its parallel in the annals of industrial organization.

In both cases trouble arises from the same cause—the tendency for the rule to become paramount and the reason to be lost, in large organizations, where the human contact between one department and another is practically non-existent. On the other hand, it must be admitted that a somewhat greater difficulty confronts the organization which attempts to settle operating questions by means of legislative machinery.

#### Why Co-operative Business Societies Fail

There is a very good reason why co-operative societies engaged in business usually fail. Operating questions are not matters for discussion, but matters for decision and action. They require not co-operative understanding so much as individual authority and responsibility. In a co-operative organization there is grave danger that while the committees debate the business will pass out of existence.

In political matters there is a distinct danger that we shall not see clearly the divergent necessities of the two functions, and that we may turn over to legislative bodies the conduct of great operations, which require an entirely different form of organization.

Under modern conditions of industry, the military form of organization, despite its value as an operating body, has failed to meet the requirements of the case. The discontent of the worker has increased; his interests have been separated from his industrial unit and absorbed by his occupational organization.

His class consciousness has been aroused; his productive capacity has been increased only where he has been provided with additional machinery; and if the recent platforms of labor federation boards in some of the states are any criterion of the general feeling, he is principally concerned with protecting his economic status and demanding guarantees against their employment.

For this reason it is necessary to consider experiments which have been made in other forms of organization, which include attempts to separate the legislative functions of the industrial group from the operating functions of the same body and to discover, if possible, to what extent they offer a basis for the logical and orderly progress of the industrial group as a producing unit.

In the modern industrial unit the principal legislative functions are those relating to wages, hours of labor, conditions of labor, protective regulations, welfare regulations, the government of physical condition, etc. These present a distinct set of problems, where the greatest permanent benefit can be secured only through the fullest measure of understanding and agreement. In many industries they are at present settled or adjusted only through the interference of the outside labor organizations or the outside manufacturers' groups, with the public taking a hand in the matter from time to time.

Thus there is no complete unified industrial organization in the manufacturing unit of to-day, but a division of organizations, completing the separation between the

(Continued on page 986)



# The Chemistry of Pickling Baths

Action of the Acid on Metal Below Scale—Effect of Variations in Strength of Bath—Increase in Temperature Accelerates Pickling Action—Organic and Inorganic Materials for Modifying Action of Bath

**P**ICKLING is a process much used in connection with the hot working of iron and steel. Whenever steel is raised to a red heat a layer of oxide scale is formed on it, and this must be removed before the steel can be machined or before it can be painted or otherwise finished. In the pickling process the scale is removed by placing the objects in a bath containing a hot, dilute solution of sulphuric acid.

Sulphuric acid being very essential in the manufacture of munitions, an increasing scarcity has been noticeable for some time, and endeavors have been made to find substitutes for it in certain of its minor applications. One of these is its use in pickling baths. The U. S. Bureau of Mines has recently conducted a research on the practicability of substituting nitre cake for sulphuric acid in these baths and the results are presented and discussed in a paper by E. E. Corbett, chemical engineer of the Bureau, just published, from which we extract the following regarding the action of the acid in the pickling bath.

## Mechanism of the Pickling Action

The free acid in hot, dilute solution attacks the metal very readily, etching it away from beneath the coating of scale and consequently throwing off the particles of oxide from the surface. Iron goes into solution as ferrous sulphate; and the hydrogen which is liberated at the face of the metal is carried rapidly to the surface of the solution, where it escapes into the air with the steam and other gases rising from the pickling bath. These vapors carry out into the room considerable quantities of acid, finely divided particles or drops mechanically entrained, and are a source of constant annoyance to the operatives, as well as a source of *avoidable* expense due to their attack on the metal work and machinery in the building. Various no-gas or foam compounds are in use as a check to this loss and nuisance. They and their action will be referred to later in this report.

## Concentrated Solution Dissolves Scale

When the concentration of acid in the solution is high, both metal and oxide go into solution, the metal dissolving so rapidly and irregularly as to give the remaining sheet or bar an etched, pitted, or acid burned surface. Very dilute acid, however, does not dissolve the oxide appreciably; its chief action is on the sound metal. The ferrous sulphate which results is hydrolyzed, forming free acid and ferrous hydroxide, which, at the surface of the hot solution, is oxidized and thrown into suspension in the nearly neutral solution as hydrated ferric oxide. Its acid constituent, though small in concentration, is free to act on a fresh portion of metal. In virtue of this decomposition of the sulphate, a given quantity of ferrous sulphate should suffice to pickle an indefinite quantity of metal, constantly renewing its acidity as the oxidation of the lower oxide proceeds. Actually, however, a solution equilibrium is soon attained; and though ferrous sulphate is an energetic pickling compound, its action is ultimately poisoned by the products of its decomposition.

## Agitation Facilitates Action

With a fresh solution, in contrast, agitation of the bath which brings the acid-filmed surface of the metal into regular contact with the air and simultaneously renews the surface of the bath, facilitates the oxidation of the hydrolyzed ferrous compound and consequently accelerates the pickling. Hence a regulated jet of heated air, introduced with the steam into the pickling vessel, should serve further to increase the ac-

tivity of the acid through the formation of ferric sulphate, which because of the readiness with which it oxidizes the metal while it simultaneously splits the acid radicle from its own molecule, is even more corrosive than acid in its attack on the sound metal. It is this very corrosiveness and rapidity, however, which make ferric sulphate solutions unsuitable for pickling, for the attack is directed almost exclusively to etching the sound metal without the interpolation of a layer of hydrogen or other protective covering, leaving the scale unaffected where it has not been mechanically sloughed off, and burning the more intensely where the full strength of ferric sulphate is thus localized.

As the quantity of acid required to pickle a metallic mass is a function of the metallic surface, so is the rate of pickling a function of the dissociation of the acid in solution. The dissociation, or pickling energy, is in turn affected by, 1, the temperature; 2, the strength of acid; and 3, the presence of other bodies whose concentration tends to reduce the effective dissociation value of the acid.

1—Thus, if the temperature of the acid solution is raised from normal atmospheric to 170-190 deg. Fahr., the reaction velocity between metal and acid will increase fifty to one hundred fold, or even in higher ratio, depending on other conditions—notably the actual concentration of the acid in solution.

## Proper Acid Strength

2—For the most efficient action in scale removal, combined with minimum attack on sound metal and consequent preservation of gage as well as economy of time in pickling, this acid strength should run between two and four per cent, representing specific gravities of solution between 1.010 and 1.032 before any metal has dissolved. These limits represent maximum acid activity on average light oxide scale, under the most economical working conditions. For heavier, unbroken scales a stronger acidity is demanded; this may run up to seven or eight, and in a few cases to ten per cent. These concentrations are best worked out for the particular problem which necessarily arises from special conditions of working before and after pickling. Here the chief considerable variable is extent of surface, with the correlated danger of unnecessary loss of metal. The attack on light gage material is of necessity more carefully restricted than on heavier stock carrying a similar coating of scale. In machine pickling, furthermore, the strength of acid must be regulated in a certain measure by the time required to unload and charge the cradles.

## Exhaustion of Bath

As the percentage of ferrous sulphate in solution increases, due to decomposition of the acid which is continually added to preserve the pickling energy, the specific gravity and viscosity of the bath tend to rise to a point at which pickling begins markedly to slow down. The beginning of sluggish circulation becomes evident after a specific gravity of 1.17 is reached; the mobility of the acid falls off until at 1.25-1.27 specific gravity, activity at the specified temperature, 170-185 deg. Fahr., is practically at an end. Here the temperature may be raised to 200-205 deg. Fahr. for a short time in order to reduce the free acid to 0.0030 gm. per c.c. of solution, and finally to "kill down" to an essentially neutral ferrous sulphate for copperas recovery.

Two of the conditions treated in the foregoing paragraph, namely, specific gravity and temperature of operation, give



rise only too frequently to sources of waste which cannot be too closely guarded against. A few companies employing excellently regulated, chemically controlled cleaning processes use the pickle liquor until the continuous addition of acid and likewise its continuous utilization have enriched the solution with ferrous sulphate to the saturation point at a moderately high temperature, while the acidity is practically exhausted after "killing down." The aim is to avoid metal and acid waste and also to end with a solution for copperas recovery which will minimize subsequent fuel consumption in evaporating off excess water beyond that concentration required to form the sugar crystals. The processes both in pickling and in sulphate recovery are scientifically controlled and adequately carried out.

#### Causes of Waste

In the majority of instances, however, the copperas is not recovered; hence the density of the waste liquor is largely determined by the length and intensity of the working day. Many works require an acidity determination before the liquor is run off to the sewer. A few, however, do not demand this check on losses; as a result an acid balance between shipping point and pickle room is not kept. Acid is added to dead pickle liquor in order to enliven a heavy, saturated solution, and as might be expected, the action is not noticeably quickened.

It is idle to expect anything but the feeblest action from a bath whose density runs in the neighborhood of 1.25-1.27, regardless of how much acid is added to it. The acid is simply sent to the sewer as waste.

#### Excessive Temperatures Wasteful

Another more subtle source of waste is reached by the excessive temperatures which the majority of works employ at all stages of pickling, whether the solution be new or old, the acid strong or weak. The steam is turned on so as to keep the surface of the bath at a constant seething boil. The slight gain in speed which results from raising the temperature of the solution from 170 deg. Fahr. to boiling is more than offset by the heat wasted in the live steam which passes into the atmosphere uncondensed, carrying out with it to the fan-exhaust system or into the room from 5 per cent to 15 per cent of the effective acid, most of it mechanically entrained.

A temperature of 160-185 deg. Fahr. should not be exceeded except during the "killing down" of dense, heavy solutions. It is a significant fact that the point of maximum solubility of ferrous sulphate lies within this range, and any substantial increase of temperature results simply in unnecessary loss and waste without a compensating gain in speed of cleaning. At superior temperatures the peak of the ferrous sulphate solubility curve is passed, and anhydrous ferrous sulphate separates from the saturated solution.

#### Injurious Effect of Ferrous Sulphate

Above, it has been pointed out that ferrous sulphate, by virtue of its yielding sulphuric acid as a product by hydrolysis or dissociation, and momentarily ferric sulphate by surface oxidation, behaves as an energetic pickling agent—even to the extent of inducing a very undesirable etching and pitting of the metal. Because of this activity it is quite unsuited to general mild operation where the end sought is chemical action which shall remove oxide scale, rust, and siliceous particles of furnace bottom, leaving the surface of metal evenly cleaned, without substantial reduction of gage, and free of discoloring compounds or color patches. In conjunction with sulphuric acid in hot, dilute solution its tendency is to accelerate or at least to maintain the velocity of action of the acid on the metal as long as decomposition products do not disturb the acid equilibrium and limit its mobility.

#### Inhibition, or Moderation of Metal Attack

3—The activity of the acid, then, is directed to attacking selectively and dissolving the sound metal rather than the more resistant oxide or scale; but in well-regulated pickling practice the selective attack is limited, and, indeed, materially redirected and controlled by the use of bodies of a colloidal nature whose influence serves to protect the metal during

scale removal. These bodies are for the most part of vegetable origin, and comprise various wood sugars and gums, and cereal starches, and intermediates occurring in commercial grain milling.

#### Organic Substances Employed

Specifically, the organic substances which have been successfully used for this purpose, in quantities sufficiently small as to give simply a distinct film to the surface of the bath under temperature conditions which moderate the charring of the inhibitor by hot acid solution, are listed below:

Molasses	Fermented yeast
Sugars	Spent tan-bark
Cornstarch	Bran
Peanut meal	Middlings
Quebracho fiber	Rye flour

The inhibitor is usually prepared as a fermented swill or mash which is added to the bath at intervals determined by the rate at which its influence is destroyed by the chemical action of the acid.

Soap-bark and the various foam compounds in use are of an inhibitory nature. The last-named commercial preparations are essentially concentrated sulphite pulp extracts placed on the market as strong solutions or as powders incorporated with ground nitre cake and rock salt.

#### Inorganic Inhibitors

Tin and copper salts are representatives of the inorganic type of semi-colloidal inhibitors; but their action is of inferior consequence and their use restricted because of the cost of adding the bath quantities sufficiently large to exercise a sensible influence, as well as their tendency, undesirable for most purposes, to plate out from solution upon the metallic surface.

The precise chemical mechanism of the inhibitor in solution has not been established; its beneficial action, however, both in limiting surface corrosion of metals, and in reducing the fume nuisance in pickling rooms is beyond question. It is believed, more commonly than logically, that a small quantity of one of these substances, thrown upon the surface of an active solution simply prevents the escape of disagreeable gases by blanketing the bath and absorbing the vapors—this, notwithstanding the difficulty of comprehending how hydrogen may be so blanketed, above a solution whose temperature rises close to the boiling point of water. It is a fact, however, that the surface tension of such a film does prevent to an appreciable degree globules of acid solution from being forced almost explosively into the atmosphere surrounding the vats.

#### Action of the Inhibitors

Nevertheless the main value of the inhibitor, from the pickling viewpoint, lies in the modifying action which it exerts on the tendency of the acid to attack the sound metal rather than the scale; and this moderating influence first shows itself in the comparatively lesser volume of non-condensable gas, chiefly hydrogen, which rises from the surface of the solution. The solution is no longer a system of acid in water, but acid in an emulsion of a starch or sugar with water; hence, in the different pickling medium the acid is carried by an organic vehicle in which its properties are necessarily modified. Similarly, the catalytic accelerating function of the ferrous sulphate in solution is neutralized; its dissociation value is reduced in the new medium, its sensible influence thus rendered comparatively inert.

Other substances than colloids are materially effective as inhibitors or polarizers; sodium sulphate acts in such a capacity, chiefly perhaps in reducing the electrolytic dissociation of the acid and in neutralizing the influence of the ferrous sulphate—possibly by forming with the latter an undissociated, or little-dissociated, double-salt in solution. Its usefulness in pickling is more or less accidental—secondary to the important proposition of utilizing the comparatively large quantity of sulphuric acid which occurs in nitre cake, a by-product in the manufacture of nitric acid, and which is available for metal cleaning as well as for many other chemical purposes.

# Rumpler Two-Seater Biplane

Technical Description of a Late Model German Reconnaissance Machine  
Issued by the British Aircraft Department

**T**HE Rumpler two-seater biplane of the CV type, illustrated herewith, was in use at the beginning of the year, but we believe we are correct in saying that it is now obsolete or fast becoming so. As the type letter C indicates, the machine is designed for reconnaissance work, and as indicated by the V, it is the fifth design of this class produced by the Rumpler works. The information here given concerning its construction and performance is based on an official report on the machine issued by the Aircraft Production (Technical) Department of the British Ministry of Munitions.

The leading dimensions, etc., of the machine are as follows:

Weight—Empty (including water), 2439 lb.; fully loaded, 3439 lb.

Military load—545 lb.; loading on wings, 9.5 lb. per sq. ft.

Weight per hp.—13.2 lb. Engine, 260-hp. Mercedes.

Capacity—Petrol, 59 gal. Oil, 3 gal. Water, 10 gal.

Endurance—About 4 hr.

Areas—Tail plane, 22 sq. ft.; fin, 4 sq. ft.; elevators, 20.8 sq. ft.; rudder, 6 sq. ft.; upper wings (including ailerons), 217.6 sq. ft.; lower wings, 146 sq. ft.

The capabilities of the machine are indicated in the following figures:

Height .....	10,000 ft.	15,000 ft.
Horizontal flying speed .....	100.5 m.p.h.	87 m.p.h.
Engine speed .....	1510 r.p.m.	1390 r.p.m.

Climb to 10,000 ft.—Time, 16 min. Rate of climb at this height, 400 ft. per min. Engine speed at this height while climbing, 1375 r.p.m.

Greatest height reached during test, 15,300 ft. Time, 38 min. 25 sec. Rate of climb at this height, 125 ft. per min.

Service ceiling (estimated)\* 15,500 ft. Absolute ceiling (estimated), 17,500 ft.

While the longitudinal control by means of the elevators is good and the directional, or rudder, control moderately light

and quite effective, the lateral control obtained from the ailerons is stated to be very heavy and ineffective and to make the machine tiring to fly. It is further stated that the machine is nose heavy and somewhat liable to get into a spin.

## Wings

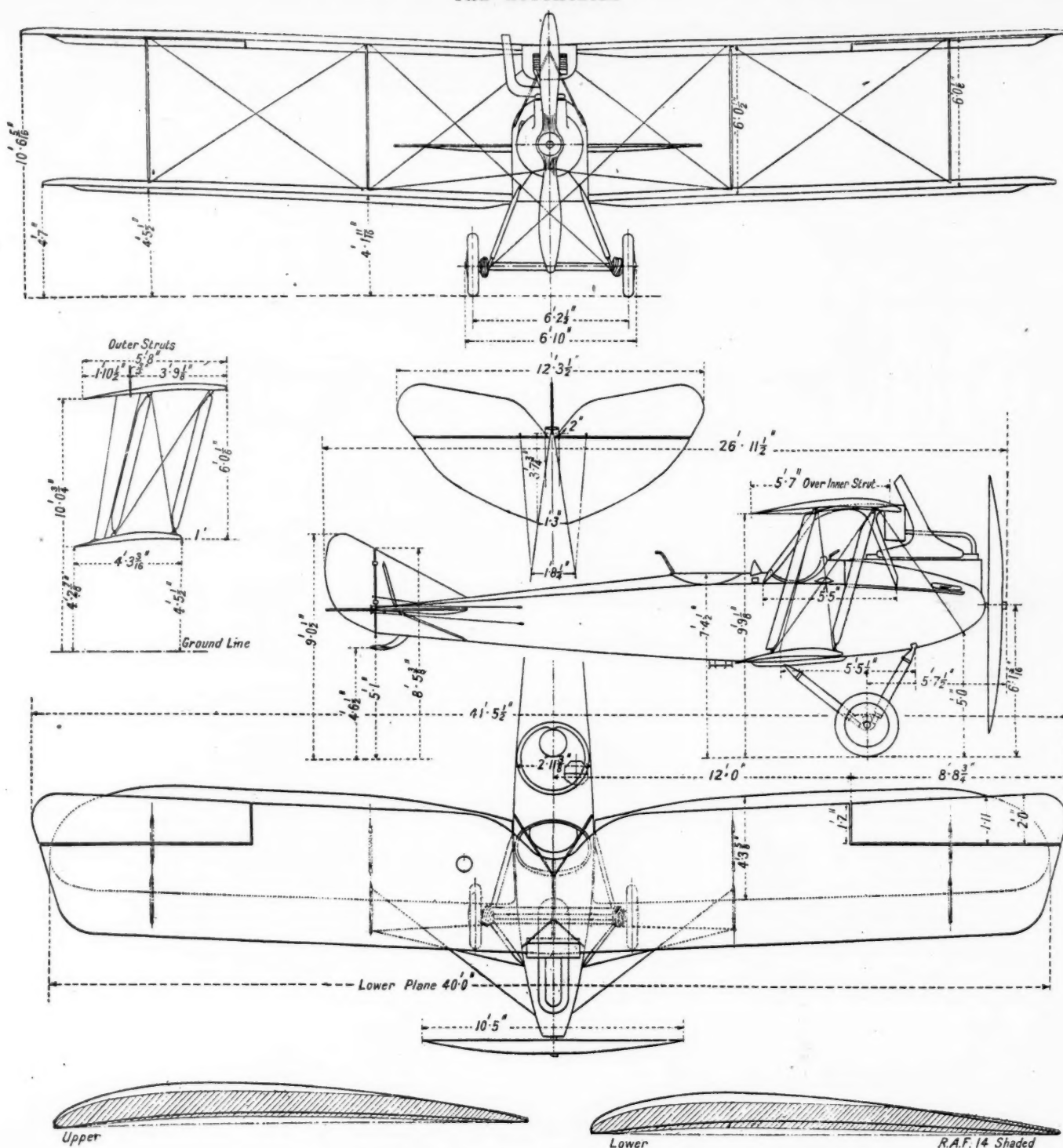
The wing sections are shown in the general arrangement on page 963, contrasted with the R. A. F. 14 section shown shaded. As usual, the German design exhibits considerable camber. The angle of incidence for the top plane is 2 deg. 40 min. and for the lower 3 deg. The front and rear spars are of spruce and, as shown in Figs. 1 and 2, are made in two parts, which are grooved and tongued and glued together. The ribs are built up of ply-wood and strips, and as usual short false ribs extend from the leading edge to the front spar between the true ribs. Between the spars steel compression tubes are arranged and are braced by piano wire at the wing tips and cable and swaged rods toward the inner end. The trailing edges of the wings are formed of flattened steel tubes to which the ribs are attached by copper rivets. The workmanship displayed on the wing structure is good, and the design and construction appear to give adequate strength. Ailerons are fitted only to the upper wings, a fact which may account for the ineffectiveness of the lateral control, which has already been noted and which is characteristic of nearly all German aeroplanes. The area of each aileron is 15.3 sq. ft.

Rapid assembly and dismantling of the machine is facilitated by the means adopted for attaching the wings to the upper cabane and to the fuselage. Fig. 3 shows the attachment for the upper wings. Each wing is locked by means of a guillotine lever, which is held in the locking position by a pin passing through holes in both levers and holes in the center section. The fixture for the lower wings is illustrated in Fig. 4. It consists of a socket on the fuselage and a ball member on the spar end. The wing is detached by loosening the struts and bracing and lowering the outer end on to the ground. The center section cabane is a welded up structure and is illustrated in Fig. 5.



Photograph of the Rumpler CV biplane

\*The height at which the rate of climb falls below 100 ft. per minute.



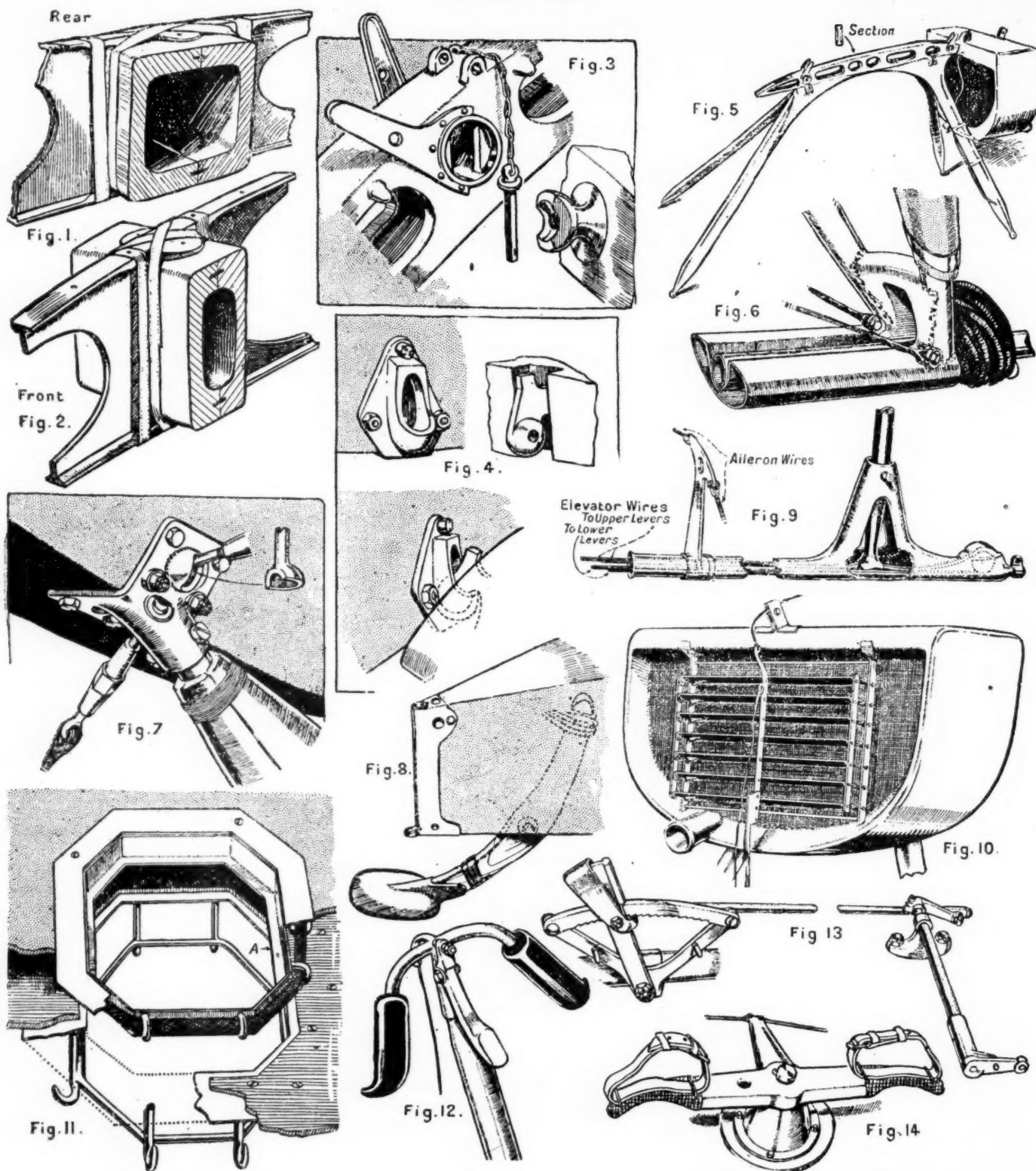
The design of the fuselage presents a compromise between the different rival methods of construction. It embraces steel tubes, three-ply wood and wooden longerons and struts braced with piano wire. From the rear of the after cockpit to the tail the fuselage framework is formed of a braced girder of wooden longerons and struts. The forward portion of the framework is composed of a similar wooden structure reinforced with steel tubes formed with forked ends and bolted together. For a distance of about 6 ft. forward from the sternpost the framework is covered with three-ply wood, which thoroughly stiffens up the fuselage at the points where the stresses thrown on to it by the tailplanes are likely to be most severely felt. From the forward end of this three-ply covering to a point abreast of the pilot's seat the framework is fabric covered. Thereafter three-ply wood is again used. The arched top of the fuselage is formed partly of three-ply

and partly of aluminum. The bottom is entirely of three-  
ply. The engine cowling is made of sheet aluminum held in  
place by means of turn-buttons.

### Landing Gear

The design of the landing gear follows the usual vee formation, with the upper extremities of the struts placed well apart. The struts are of streamline steel tubing. The front limb is of smaller section than the rear one, and has been additionally faired with wood, obviously as an after thought and not by the manufacturer. At the lower ends, as shown in Fig. 6, the struts are welded together by a bridge piece and joined to the sheet steel streamline sectioned trough within which the axle rests during flight. The landing shocks are taken by steel coil springs, and not, as might be thought from Fig. 6, by rubber cord. Four bracing wires connect the





four upper points of attachment of the struts with the apices of the vees. In Fig. 7 one of the front strut attachment pieces is shown.

The elevators are unbalanced. In the earlier CIV Rumpler machine they were balanced, so that as the longitudinal control of the CV machine is reported to be entirely satisfactory, it would appear that unbalanced elevators have been found all that is desirable. The fin area, in view of the side area, presented in the nose of the machine is regarded as hardly sufficient and the deficiency in this respect is suggested to be the cause of the tendency shown by the machine in flight to get into a spin. The four tail stays are of streamline steel tubing, the lower pair being serrated to remind the mechanics

not to lift the machine or hold it back by grasping these stays. The fabric has not been removed from the fin, rudder or elevators; but it is believed that the framework of these members is formed of welded steel tubing in the usual way. The tail skid is illustrated in Fig. 8. It is of ash, pivoted at its center and sprung at its upper end. The lower end is provided with a sheet steel shoe of the shape shown.

#### Control System

The controls are arranged in an unusual manner, the ordinary transverse rocking shaft for the elevators being dispensed with. The arrangement used is illustrated in Fig. 9. It consists of a longitudinal rocking shaft of steel tubing to

which a coned portion is welded, and on which a double-ended lever for the aileron wires is pinned. The vertical control lever is pivoted within the cone-shaped portion and is attached at its lower end to the cables extending to the upper levers on the elevators. The cables from the lower elevator levers are led round pulleys situated within the end of the longitudinal rocking shaft and are thence taken to the end of the control lever. The aileron cables are led over pulleys into the interior of the lower wings, and so up to the levers of the ailerons on the upper wings. These levers, as usual in German practice, lie in line with the main plane and are accommodated within slots cut in the rear edge thereof. The rocking shaft, shown in Fig. 9, lies somewhat below the level of the fuselage bottom, and is enclosed within a sheet aluminum farling screwed to the fuselage. The rudder bar, Fig. 14, is of welded sheet steel and is provided with rubber sleeves and leather straps to prevent the pilot's feet slipping. No provision is made for adjusting the distance between the bar and the pilot's seat.

The armament consists of a fixed Spandau gun controlled by the pilot and a Parabellum gun mounted on a rotatable ring in the usual way at the observer's cockpit. The pilot's gun is fixed close to the starboard side of the engine and is inaccessible during flight. It is controlled by a thumb lever on the control stick—see Fig. 12—and is fitted with the usual synchronizing gear. An aluminum tray with holes for ten Verey lights is fixed to the fuselage. Provision is made for fitting a bomb rack, but no rack was found on the captured machine.

The engine is of the 6-cylinder, 260-hp. Mercédès type, but on other Rumpler CV machines a 240-hp. Maybach engine has been found. Both of these engines have been fully described in these pages. The radiator is illustrated in Fig. 10. It is slung, as shown in Fig. 5, from the central cabane structure. Its honeycomb is formed of circular brass tubes expanded at their ends into hexagons, and there sweated together. The total radiating surface is 1.5 sq. ft. The shutters regulating the cooling surface are operated by cables, one passing over the top of the radiator and one exerting a

downward pull and passing beneath. German pilots have reported that these shutters are rarely required except during protracted descents. A mercury thermometer is used to indicate the temperature of the cooling water and is marked in red to show the permissible range, which extends from 60 deg. to 85 deg. C. The radiator is regarded as thoroughly satisfactory, but it must obstruct the pilot's view somewhat.

The oil tank is situated on the port side of the engine and is lagged with a thick covering of felt to preserve the contents at an equable temperature. The main fuel tank has a capacity of 57 U. S. gal. and is arranged to serve as a support for the pilot's seat. An auxiliary tank of 16 gal. capacity is fitted between the two cockpits. Both tanks work under pressure. The initial pressure is obtained by means of hand pumps, of which there is one in each cockpit. Once the engine is started the pressure is maintained from an automatically regulated air pump driven off the engine. The tanks are made of sheet brass and each is provided with a pressure gage on the dashboard. By means of three 3-way cocks the pilot can shut off the fuel entirely, run on either of the tanks separately or on both simultaneously. The engine throttle valve is controlled by the gear shown in Fig. 13. The fact that the Mercédès carbureter is situated at the rear of the engine permits a direct control of the design illustrated to be adopted.

A tachometer working on the centrifugal principle and graduated from 0 to 1600 r.p.m. is driven off the engine crankshaft. It is not illuminated and is not marked to show the normal speed. The propeller has a diameter of 3150 mm. and a pitch of 1830 mm. It is secured to the crankshaft by eight bolts instead of the usual six. The machine is wired internally for wireless and a tapping key is fitted close to the observer's right hand. The rack for the aerial reel and a sheet steel shelf for the wireless dynamo were found in the captured machine, but other wireless details were apparently absent. The machine carried two cameras; one, a particularly large one, being accommodated in the fitting illustrated in Fig. 11, comprising a light octagonal tray *A* suspended from the floor boards by means of elastic shock absorbers.

## Wismach American Gage Blocks

**I**N all high-class manufacturing processes use is now made of gages of one kind or another, including standard gages, limit gages, etc. Standard gages are used for checking up other gages used in the shop. A new set of standard gages, known as the Wismach American gage standard, has recently been placed upon the market by O. Zernickow, 15 Park Row, New York.

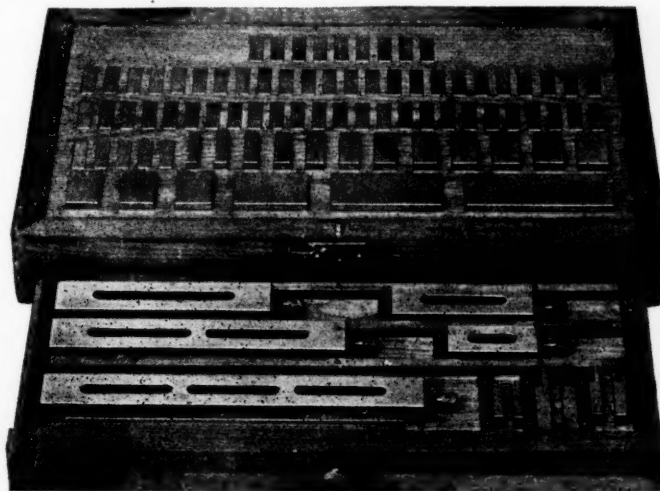
These gages come in five different sets. The No. 1 set is adaptable to combinations of 1/10,000 in. and the individual blocks are claimed to be accurate to 1/10,000 in. at 68 deg. F., at which temperature they are standardized. No. 2 set is similar to No. 1, but has not quite the same number of blocks. The No. 4 set gives dimensions in fractions of an inch, and the No. 5 set contains blocks in metric sizes.

These gage standards are made of high-carbon steel in rectangular prism shapes and have highly polished parallel surfaces, the distance between which is marked on the block. Owing to the fact that objects of hard steel are subject to variations in their shape and dimensions for a considerable time after they are completed, the Wismach gage blocks are subjected to a tempering process of long duration. It is stated, however, that this process in no way reduces their hardness. The tempering neutralizes the local strain within the metal and eliminates any further dimensional variations.

These gage standards are not magnetic, and care must be taken not to allow them to become magnetized, as if they are magnetic they will attract small particles of iron and steel, which will adhere to their surfaces and render the surface-to-surface combination impossible. The measuring surfaces are parallel to such a degree that in a proper combination of any number of blocks the units join just as if they were a single solid piece. The combination of two units is effected by sliding one block over the other and applying a little pressure at the same time. The surfaces then remain tightly held together by molecular attraction. Before doing this it is

important, however, to first wipe off any oil or grit which may have collected on the surface of the gage blocks.

Most of the combinations required in practice involving three decimal places can be made up of two to three units, while at most five units are needed for four decimal places. An interesting feature in connection with the gages is that they are self-checking. These blocks will also adhere to each other if only portions of the surfaces are superimposed. There are always several combinations for every total, so that the same total standard can be set up at least twice from one set of gage blocks. In checking, the two combinations are placed between any other two blocks.



Set of Wismach standard gages



# German Piracy of American Trademarks

## Advantage Taken of Foreign Laws Giving Right to Exclusive Use of Trademarks Merely Through Registration—Misuse of International Bureau

By Albert E. Parker\*

THE unscrupulous methods followed by German traders prior to the war, in attempting to monopolize foreign markets for their wares, have received considerable emphasis during the past 2 or 3 years by the evidence which has been brought forward from various quarters of the activities of German and Austrian firms in registering well-known American trademarks in foreign countries.

These activities have reached such a climax, and have extended into so many countries that government departments, such as the Bureau of Foreign and Domestic Commerce, have found it necessary to issue warnings calling attention to this practice, and advising American manufacturers against entering into trading relations with different countries before registering their trademarks in such countries; and it is believed the matter is one which will have to be brought up for adjustment on equitable lines at the peace conference.

### Piracy of Trademarks

In June last the Department of Commerce called attention in Commerce Reports to instances of the piracy of trademarks, consisting of the names of well-known American automobiles, motor trucks, pharmaceutical preparations and other articles the sale of which depends largely upon advertising and good will, and cited the case of a single firm applying for registration of the trademarks of six among the best-known American cars.

The report further stated that if registration had been granted thereon it would have been practically equivalent to the acquisition of an exclusive agency for the importation of each of these six cars in one of the most important foreign markets for automobiles, unless the manufacturers were willing to adopt a new trademark for that particular market.

It is not generally appreciated by manufacturers that in many foreign countries the exclusive right to a trademark is acquired by registration, and not, as in the United States, by actual use of the mark upon the goods sold thereunder.

In such countries as Argentine Republic, Bolivia, Chile, Costa Rica, Cuba, Germany, Guatemala, Nicaragua, Norway, Paraguay, Peru, Portugal, Santo Domingo, Serbia, Sweden, Turkey and Venezuela the right to a mark is granted by the registration thereof in such countries, and no consideration is given to the trader whose goods may have been sold thereunder but who has failed to comply with the statutory requirements of the countries concerned, and thereby secure a monopoly of the mark against all others.

### Laxity on Part of Owners

The laws of the United States, England, France, Belgium, Italy and the British colonies, among other foreign countries, provide for recognition of trademark ownership to the first to use the trademark in such coun-

tries, and while this is a reasonable and equitable arrangement it has undoubtedly led to a certain laxity on the part of American and British traders, who have assumed that the laws of foreign countries generally followed their own on this important matter.

A provision exists in the laws of some important foreign countries, including Great Britain and some of the chief British colonies, under which the registration of a trademark becomes conclusive of ownership after a few years from the date of registration, but before suit for an infringement can be brought under such a registration it is generally necessary to establish that the mark is in actual use upon the goods for which protection is claimed, as without such use the alleged infringer could counter claim for cancellation of the trademark on the ground of non-user.

### Benefits of Trademark Conventions

The benefits of conventions providing a simple and economical system of protecting trademarks have been recognized by European countries for many years past, and full advantage has been taken of such conventions by the countries which have adhered thereto, as is instanced by the fact that in the twenty-five years during which the Berne International Trademark Convention has been in operation about 20,000 trademarks have been registered through an international bureau.

The arrangement of this bureau, established at Berne, Switzerland, in 1893, provides for the registration of trademarks in thirteen countries by the simple procedure of paying a fee of 100 francs to the central bureau, which then notifies all the trademark offices of the other countries of the depositing of the trademark, and these thirteen offices register the mark, while the courts give the same protection thereto as would be afforded under separate registrations made in those offices.

The countries which are parties to this Berne Convention are as follows: Austria, Belgium, Brazil, Cuba, Spain, France, Hungary, Italy, Mexico, Holland, Portugal, Switzerland and Tunis.

It will be noted that Germany is not a party to this convention, but Austrian firms, and German firms established in one of the convention countries, have not failed to take undue advantage of the arrangement to the serious detriment of American traders.

### Tire Trademarks Stolen

Before the United States entered the war the trademarks of practically all the leading tires made and sold in the United States were registered under this international convention by one Richard Mittler of Vienna, Austria. By paying to this Central Bureau in Berne, Switzerland, the small sum of \$180, Mittler was able to protect in his own name the marks of nine of the best-known American tires in the thirteen countries of the convention, and in so far as those countries give protection to the first to register the trademark, he has acquired exclusive rights to such trademarks, unless the rightful owners had previously taken the precaution to register the same in their own names in those countries.

\*Mr. Parker is a member of the firm of Marks & Clerk and is a recognized authority on the subject of International Trademark Law.—EDITOR.

Mittler is now in the position where the American traders who failed to previously register the mark must negotiate with him to buy back their trademarks, or else change the name of the goods for that particular market.

Many other instances of the use of this International Bureau by Austrian firms, or by German firms located in one of the countries of the convention, can be cited.

As the United States is not a member of the Berne Convention, American manufacturers cannot take advantage of the simple procedure available to citizens of the countries which have adhered to the convention, and it is necessary, therefore, for trademarks to be separately registered in the thirteen countries in order to fully protect the American trader.

### South American and Other Piracy

A leading attorney in the Argentine Republic is now compiling a complete list of applications by Germans to register well-known American trademarks, of which scores of instances can be cited, so that proper action can be taken to recover these trademarks, either through the State Department by diplomatic action in the Argentine, or through such other government bureau as may be found advisable.

Many American manufacturers are at present debarred from using their trademarks in Scandinavian countries by reason of the fact that registrations have been secured thereon in the names of residents of those countries. In some of these cases the marks have been covered by agents of the American manufacturers—in the names, however, of the agents, who have thereby secured a monopoly thereon. It will readily be seen how an unscrupulous agent can exercise this monopoly to the serious detriment of the American trader.

### The Buenos Aires Convention

The International Convention of Buenos Aires, which was signed in 1910, and of which the United States is a member, will provide a simple procedure, similar to that available under the Berne Convention for the protection of trademarks on the American continent. This Buenos Aires Convention has been ratified by a sufficient number of the northern group of countries to enable it to be brought into operation, ratifications having been filed with the Cuban Government by the following countries, in addition to the United States: Costa Rica, Cuba, Dominican Republic, Guatemala, Honduras, Nicaragua and Panama.

The Cuban Government has appointed a director to take charge of the bureau, and has appropriated \$25,000 toward the cost of erecting a permanent home, and has authorized the president to give a suitable site in the city of Havana for the purpose.

Rules have been drafted for operating under the convention, and these have been submitted to the officials in the countries above referred to, so that it is expected that applications for registration at this International Bureau, covering the eight countries of the northern group which have ratified the same, may be accepted for filing and for communication to the other countries in a few months' time.

The United States Congress has had under consideration a new bill for giving effect to the convention in the United States, and this bill has passed the Senate and is now before the House for action. Congress has been requested to appropriate such proper sum as will adequately represent the quota of the United States toward the cost of maintaining the bureau as well as the cost of erecting its permanent home.

It will be noted that Mexico, Salvador and Haiti,

among the northern group of countries, have not ratified the convention, so that separate protection has to be obtained in those countries.

### Southern Group—Ratifications Incomplete

It should be clearly understood that for the present no possibility exists of securing any benefit, so far as the South American countries are concerned, from the Buenos Aires Treaty. A sufficient number of countries in that group has not yet ratified the convention to bring it into operation, and it still requires two further countries to send in their ratifications before arrangements for the opening of the office at Rio de Janeiro can be made. In view of the fact that the piracy of trademarks, particularly by enemy aliens, is most common in South America, and especially in the Argentine Republic, it is essential for the full protection of trademarks there that separate applications be filed to register the same as before.

One of the great difficulties militating against ratification by the Argentine Republic is that this will require recognition of trademark rights by the actual user, instead of by the first to register, as at present is the law of that republic.

In the past it has been a common practice for so-called agents of United States traders to enter into an agreement to represent the United States manufacturer, and to obtain a shipment of goods bearing the trademark, which in the meantime the Argentine agent has registered in his own name in that republic, and when the goods reach him these are confiscated, and unless new arrangements are made with such agent to his advantage the trader in the United States not only loses his goods, but also his trademark, and has to adopt an entirely new brand in that country.

It will readily be appreciated that as the courts of the Argentine Republic encourage practices of this kind by rendering decisions in favor of the first to register the trademark, officials there are not willing to ratify the convention of 1910.

### Under Webb Export Bill

The act known as the Webb law, passed by Congress in 1917, legalizing the formation of associations or trusts for the purpose of engaging in export trade, has provided an excellent means of building up foreign markets if proper advantage is taken of the measure, and it is believed that more attention should be given to this important piece of legislation and efforts be made by groups of the leading traders in different lines of industry to form associations for securing the full benefits thereof. Such associations, when properly organized, could undoubtedly exert considerable influence on the officers of commercial organizations in South American countries to secure either ratification of the convention, so as to bring it into operation there, or changes in the laws of those countries which would recognize the ownership of trademark rights based on the prior use of a trademark.

If the operations of the trademark bureau to be established at Havana indicate that the international registration of trademarks is advantageous to the members of the union, undoubtedly pressure will be brought to bear on the Government to seek admission to the Berne International Convention above referred to, so that there will gradually be built up a system which will tend to the eventual establishment of a single office for the registration and publishing of trademark rights in all countries of the world.

The proposal for the designing and adoption of a national trademark, for which a bill was introduced in

(Continued on page 986)



## Airplane Engines Manufactured and Shipped

	At Airplane Plants	Shipped to A. E. F.	Shipped to Navy	To Allies	At Fields	Total
Training Engines .....	9110	325	515	1	6169	16,120
Combat Engines .....	5245	4981	3746	1090	632	15,694
Total .....	14,355	5306	4261	1091	6801	31,814

# Official History of Aircraft Production

Objects, Problems, Production and Results of Entire Air Program  
Laid Bare in Conjunction with Complete Exhibition  
of Planes and Equipment

WASHINGTON, Nov. 27.—The first definite and comprehensive official reply to past criticisms of military air activities was made here to-day when complete information about production of engines and planes was disclosed at the War Department by Air Service officers in the presence of Secretary Baker. The information was given in connection with an exhibition of a DeHaviland 4 plane partially stripped and exhibited with all its accessories and parts in a room at the State, War and Navy Building. The front half of the fuselage was shown equipped with four machine guns.

Primarily, the history of engines and planes related by Lt. H. H. Emmons, U. S. N., R. F., A. S. A. P. in charge of engine production, developed that the original plans of the Aircraft Production Board headed by Howard E. Coffin have practically been followed completely from the beginning to the end of the war; that only two changes were made in the original design of the Liberty engine as laid down in May, 1917, despite all rumors to the contrary; that J. G. Vincent, vice-president in charge of engineering of the Packard Motor Co., and E. J. Hall, Hall-Scott company, were

the actual designers of the Liberty engine; that in October of this year the United States turned out more engines than the combined Allied air factories produced in any one month during the war, and by April, 1919, the United States would have produced 10,000 Liberty engines a month.

The original contracts for 22,500 Liberty 12 engines, said Lieutenant Emmons, had been increased to 51,100 exclusive of contracts also placed for 44,893 other airplane engines, including 10,000 Hispano-Suiza 300-hp. engines, 8000 eight-cylinder Liberty engines, and rotary

and other engines. The production up to the signing of the armistice was 31,814 engines, of which 15,131 were Liberty 12s.

In October 5603 engines were turned out with a program calling for 8000 in January, 1919, and 10,000 a month for the following 4 months.

In contrasting our production with that of the foreign countries Lieutenant Emmons stated that in August, American production of Liberty 12s totaled 3850, while

Great Britain producing the Rolls-Royce—the only engine comparable to the Liberty—turned out only 59 per week.

Twelve thousand two hundred eighty-five airplanes, including both training and service planes, were produced up to the time of the armistice, including 3103 service planes for the expeditionary forces. In addition 700 kite balloons had been produced.

The cause for the failure of the Bristol was also explained in the discussions of the Liberty engine changes. These changes were due, it was said, to design, increase of power and manufacturing limits. The only design changes made were in the lubrication system, which was changed from scupper feed

to the forced feed, and an alteration in a part of the connecting-rod to allow sufficient play.

The power was increased twice in response to orders from the A. E. F., first from 330 hp. to 375 hp. and again to 440 hp. at the same time necessitating an increase in weight from 785 lb. to 860 lb.

The manufacturing limits were changed only in so far as this is a common practice in all production. The increase in weight from 785 lb. to 860 lb. may explain the Bristol failure.

Col. E. V. Clarke who selected the Bristol plane for the

## Salient Features of Aircraft History

1—Original Aircraft Production Board plans found correct and successful.

2—Official recognition given to Jesse G. Vincent and E. H. Hall for the design of the Liberty airplane engine.

3—Only two changes made in the original designs of the Liberty airplane engine.

4—Liberty engine production over 5000 in October, 1918.

5—Liberty engine production would have reached 10,000 a month in April, 1919, if the war continued.

6—More than 95,000 airplane engines on order at the signing of the armistice.

7—More than 31,000 training and combat engines delivered prior to November 1.

American program testified before the Senate Committee that his understanding of the Liberty engine weight was under 800 lb.

A committee composed of experienced production executives in the automobile industry, said Lieutenant Emmons, worked directly with the production section of the Air Service and included H. M. Leland, Lincoln Motors Co., C. Harold Wills, Ford Motor Co., and Messrs. Bell and Roberts of the Packard Motor Car Co.

The exhibition included practical demonstrations of the accessories used on the DeHaviland 4 with the most remarkable exhibit that of the flexibility of the two Lewis machine guns used by the observer. These guns weighing several hundred pounds are so arranged on a mounting as to allow firing both with one hand in any direction except directly below the plane.

Compasses of a type said to be much superior to the Allied compasses were being produced at the rate of 500 per week. A photographic machine exhibited is so constructed that it contains a long roll of film capable of taking 100 photographs in a row each 9 in. wide which when joined make a complete mosaic chart of the territory photographed.

Following are the complete statements made, the first a general introduction by Col. L. P. Ayres, General Staff, the history of aviation engine production by Lieut. H. H. Emmons and the descriptions of the manufacture of accessories by various officers:

"The Bureau of Aircraft Production is charged with the design, purchase, production and inspection of all material special to the Air Service," said Col. L. P. Ayres.

"There have been produced in this country during the period of the present emergency in excess of 12,000 airplanes, 30,000 aviation motors and 700 kite balloons, together with a vast variety and quantity of accessories therefor.

"In arranging this exhibit it was evidently impossible to illustrate all of the products involved. The exhibit, therefore, is concentrated on the DeHaviland 4 plane, which is an observation machine of advanced type, and is the American-built plane which has been extensively used over the front in France.

"The front half of the fuselage shown is one of over 500 machines lying at port awaiting shipment overseas when the armistice was declared; it is a regular stock machine and is in no way especially prepared for this exhibition.

"The accessories shown around the room are all parts of the equipment of the same DeHaviland 4 plane. At no time are all of these accessories installed on the plane at the same time, the particular installation depending on the service required. Nevertheless, all of the accessories must be furnished, and the machine must be designed to take each and every one of these accessories when required.

"In the production of airplanes, the limit has always been the possibility of engine production. Consideration of the vast investment in factory and machine tools, and the extremely high character of the workmen required makes this plain.

"It is felt that the second limiting point lies in the accessories, including instruments, armament, bombing equipment, radio equipment, photographic equipment, oxygen apparatus and the special clothing and personal

### AIRPLANES MANUFACTURED AND SHIPPED

	To A.E.F.	At Fields	To Navy	Total
Training Planes.	0	8170	140	8310
Service Planes..	3103	717	155	3975
<b>Total .....</b>	<b>3103</b>	<b>8887</b>	<b>295</b>	<b>12,285</b>

equipment of the aviator.

"The actual construction of the airplane is less difficult, as the investment in machinery and tools is much less, and the labor involved relatively less skilled.

"The special raw materials for airplanes have involved vast industrial operations, examples of which follow:

"It fell to the United States to supply spruce for the entire air program of the Allies and the United States. In October, 1917, these requirements were 5,000,000 ft. per month, with only 2,500,000 ft. per month being produced. In October, 1918, the requirements were 20,000,000 ft. per month with over 25,000,000 ft. being produced.

"These operations involved 30,000 men in the Northwest. It should be borne in mind that lumber actually usable in the airplanes is a relatively small percentage of even the best logs.

"Early in the war, it was evident that the Irish supply of linen would fail. Cotton fabric for airplane use was developed in this country and at the time of the signing of the armistice, about 2500 looms were producing about 1,200,000 yd. per month. There had been delivered up to that date a total of over 13,000,000 yd. of airplane fabric.

"The balloon cloth is of finer weave and 3200 looms were required to produce about 720,000 yd. per month."

In his outline of the history of aviation engine production Lieut. H. H. Emmons, U. S. N., R. F., A. S. A. P., Chief of the Engine Production Department, said:

"At about the time of the declaration of war, Mr. Coffin, and soon thereafter Mr. Deeds, were called upon to organize the production of aviation equipment. Naturally, the first point to be determined was what was to be produced. Limited to the engines, it became clear that three courses were open to them:

"1—To send a commission of experts abroad to study the engines used by the Allies.

"2—To encourage production in this country of such suitable foreign engines as had already been put in production in the United States.

"3—To develop a suitable engine from the talent and facilities available in this country in automobile and allied industries.

"Action was taken along each of these three lines.

"A commission, comprising Major Howard C. Marmon, Lieut. Col. V. E. Clarke and others, was sent abroad and made extensive investigation. The result of this appeared to be that the two best high-powered foreign engines were the Rolls-Royce and Lorain Dietrich. The Rolls-Royce does not adapt itself to American methods of manufacture and the Lorain Dietrich was not at that time completely demonstrated or accepted.

"In the United States the General Vehicle Co. was attempting, in a very small way for the Allies, to produce the Gnome 110-hp. rotary engine. Production, however, had not yet started, and facilities and talent for the production of a rotary engine did not exist in this country.

"The Wright-Martin Aircraft Corp. was beginning in a small way the production of Hispano-Suiza 150-hp. engines for the Allies. Production had not yet started and the power of this engine was so small that it was apparent that it would soon be obsolete for fighting purposes.

"Both companies, however, were assured of business

(Continued on page 987)



# Cultivating Japanese Automotive Field

## PART III

### Types of Automobiles Desired—Equipment and Finish—Japan Ambitious to Build Cars—Experimental Work Being Undertaken—Body Building Developed

By Tom O. Jones\*

**T**HE general principles of motor-car construction prevailing in America meet the requirements of Japan. There are, however, some modifications that would increase business in Japan and possibly in other export fields. A car with a comparatively short wheelbase, a small, high-speed engine, low rear axle, gear reduction, and a chassis that will permit attachment of a heavy limousine body, should prove popular. The price need not be held extremely low, for it is the type of car that would appeal to the wealthier Japanese, as meeting his desire for a car that would afford ample body room and at the same time be small enough to be handled easily in the narrow city streets. Possibly the reason higher-priced American cars have not become more popular in Japan is due as much as anything else to the American tendency to lengthen the wheelbase and build a generally bigger car, harder to handle on sharp turns.

The proposal of such a small car met with general approval from every dealer to whom the subject was broached. It is simply a case for American manufacturers to figure out whether the building of such a car in small quantities would be a financial success. It should be borne in mind, of course, that the business would be for chassis only, with the body built in Japan, a condition made necessary by high shipping costs. From this it may be concluded that the small car generally will be the most suited and acceptable for the market, either in the complete car or chassis. Why the closed car is more greatly in favor in Tokyo is explained by the fact that with the limousine construction the driver is separated from his passenger. Moreover, in the summer the capital is dusty, and a passenger in an open car is subjected to clouds of dust. The heat of an inclosed car, even without the least ventilation, is preferable to this dust. As the American woman has had much influence in motor-car construction, so may her Japanese sister be credited for the preference for

closed cars. Japanese women do not wear hats, and with hair daintily combed there is opportunity for tragedy if a wind storm strikes the fair occupants of an open car.

Although closed cars are undeniably the preference of those able to afford them, it must not be concluded that open cars have no field. They meet the demand for country travel, for renting service, and are largely used by foreigners. The American manufacturer will find his trade about equally divided between chassis and complete open cars.

The following details of design preferred in chassis construction reveal how little special engineering is required to meet the demand for Japan in a mechanical way.

#### Mechanical Features

**Engines.**—Generally, the preference is for block engines, either four or six-cylinder type. There is evidently no preference for overhead valve or L-head construction, but the engine must be serviceable, for it is in its construction, repair and adjustment that the

Japanese mechanic is at a loss more than in any other part of the car. Eight-cylinder engines are meeting with favor. There are at the present time less than half a dozen twelve-cylinder cars in Japan, but doubtless this is due to the size of the cars rather than to any objection to an engine with this number of cylinders. The sixteen-valve type is at present unknown in Japan, although six sample cars with engines of this type are now on the way to the biggest car-selling company in the Empire. The ideal engine for Japan is an economical, high-speed, four or six, in accordance with car size and weight.

**Transmission.**—A three-speed gearset will meet every requirement for Japan. A four speed is practically useless, for there is hardly any place where extreme speed can be utilized. The location of the gearbox is unimportant, with the possible exception that the transmission in unit with the power plant has preference over location on the rear axle.

**Clutch.**—On this point there is nothing that requires deviation from general practice. Either type is satisfactory, and will cause no prejudice either for or against the car in the mind of the buyer.

**Rear Axle.**—Little discussion as to the comparative merits of live or dead axles is heard in Japan, but there

**J**APAN prefers chassis with short wheelbases owing to narrow streets and sharp turns.

Enclosed bodies are popular owing to prevalent dust and also to the desire to separate the driver from the passengers.

Little special engineering is required to meet the general demands of Japan in a mechanical way. Local repairmen are not expert on engine repairs.

Although in Japan the driver keeps to the left side of the road there is no definite demand for right-side steering. However, it is preferred and, though not essential, will help sales.

\*EDITOR'S NOTE—Mr. Jones was formerly with the J. B. Cockett Co., New York, and was given a special appointment by the Bureau of Foreign and Domestic Commerce to investigate automotive conditions in Japan, China, the Philippines and Hawaii. This story is taken from the advance proof sheets of Mr. Jones' report to his departments. Part IV will deal with Japanese repair facilities, shipping regulations, duties, etc.

is a preference, and the sale of a car will be aided by a full-floating type of construction.

**Brakes.**—No part of the car construction is more vital than the braking system. The importance of powerful brakes is impressed on one continually. The regulations of Tokyo provide that "every automobile shall be equipped with two brakes, one working on a drum fixed on the wheel or axle, the other working on the other parts of the machinery," while the Yokohama regulations provide that "two brakes shall be provided on each automobile, one being applied to axles, wheels, or hubs, to enable the car to stop immediately upon application, and the other to prevent the car from backing. Both of the brakes shall be arranged so as to automatically stop the car and also regulate the speed." These clauses are, of course, not lived up to absolutely. The general American application of brakes to rear wheel drums is passed by the inspectors. It is well-nigh a crime to send a car into Japan unless its braking system is efficient, as the congested traffic conditions demand the constant application of brakes. The brakes must be relined and adjusted frequently, and adjustments, therefore, should be as accessible as possible.

**Other mechanical details.**—Strange as it may seem, with road rules the opposite of those in America, no great demand is made for right-side drive. It is preferred, and, while not absolutely essential, will help sales. Battery ignition is well established, and the magnet at the present time does not have the preference it did a year or two ago, although its fitting still has a favorable effect. Carburetors should have as few adjustments as compatible with efficient operation.

#### Equipment and Finish

Standard equipment, such as top, windshield, speedometer, lights, etc., give everything the Japanese require. Details requiring care and adjustment meet with disfavor rather than otherwise. Some of the requirements upon which there are differences in building for export trade are set forth below:

**Speedometer.**—Registration should be in miles, as the British standard is used throughout the country in measuring distances.

**Horn.**—The ordinary equipment may be furnished. It is probable that the old-fashioned bulb horn will be fitted when the car is put in service, but these are now made in Japan, and will be obtained by the dealer. The bulb type seems to be the recognized automobile warning signal in Japan, and its use is alternated with that of the newer types.

**Tires.**—Clincher types are most easily obtained in Japan, but straight-side types may be secured through American companies. The one tire factory now established in the Empire is building clincher tires exclusively, but seeing the probability that in the future the straight-side tires will be demanded, has equipment ready to build this style on short notice. Under present conditions, clincher tires assist in selling the car. Most dealers in Japan desire cars fitted with clincher rims and shipped without tires.

In style and finish, as little change from our common practice will be necessary as in mechanical construction, but the following points should have attention:

**Color.**—In open cars, any of the standard body colors, such as blue, gray, green and brown, will meet requirements, with lighter colors having the preference.

**Tops.**—Black tops will meet the demand. While no dealer interviewed indicated any decided preference for khaki-colored material, an option of either black or khaki is an added inducement. The climate generally does not go to extremes of hot or cold, therefore the mate-

rials used in standard production at home will meet every requirement.

**Upholstery.**—In any car selling above \$1,000 (American list price) the upholstery should be of leather. On cheaper cars imitation or substitute fabrics will fulfill the needs, but when it comes to buying an expensive car—and it must be borne in mind that the selling price in Japan will be in the neighborhood of twice the American list price—the Japanese buyer is earnest in his desire for real leather. All closed bodies are finished in whipcord, a light gray mixture having the preference, with silk window curtains to match.

**Metal Trimmings.**—Nickel-plated finishings are highly in favor. Most of the cars used in Japan are driven within only a few miles of the sea. There are some instances of rust absolutely spoiling the appearance of a car. If black japanned finish is used on any parts the enamel should be heavy, and baked hard, to withstand the elements.

**Seating Arrangement.**—The standard American bodies meet all requirements in Japan. It should be remembered that the Japanese are generally a small people, so that in bodies which in America we considered the limit in smallness for five persons it is not uncommon to see two extra seats added to make the vehicle of seven-passenger capacity, and every one seems to be comfortable. Within the past year the four-passenger clover-leaf type of roadster has become popular, practically every car of this type being sold immediately on arrival. These sales were found to be almost evenly divided between Japanese and foreigners. The fact that sales of this model had been made to Japanese seemed rather in contradiction to the statement that the Japanese wanted to be kept well removed from the driver.

Japan is ambitious to build motor vehicles. The desire to enter the construction industry has become instilled in the minds of men of not less than five or six organizations, either operating now in different lines of industry or to be formed for the purpose of building cars. The plans in every case are still embryonic.

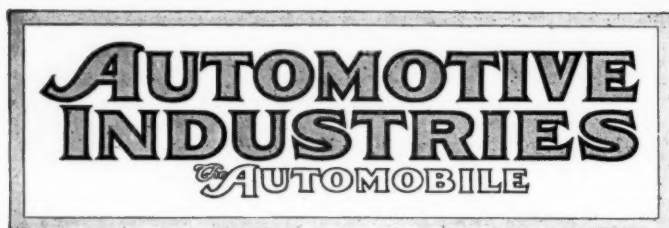
#### Motor-Car Manufacturing in Japan

As an impetus to the building up of a motor-manufacturing industry, the Japanese Government has since the first of this year instituted a system of subsidies, whereby all home-built motor trucks carry a bonus of \$1,000 and foreign-built trucks \$500. This is advanced by the Government at time of purchase and is followed by \$150 annually for upkeep. This subsidy will be paid for vehicles of at least 1 ton capacity originally built for commercial purposes and will not apply to converted passenger cars or vehicles developed by attachments to chassis. The idea is, of course, to apply the subsidy only to vehicles that will be of immediate and satisfactory service to the army if required. These vehicles are subject to military requisition.

The main difficulty in any building to date seems to be that no definite decision can be reached as to the type of car that should be built. The general impression is that a low-priced small car is the most suitable and the one offering the greatest opportunities. In Japan, as everywhere else, there is room for more than one type of passenger car, and probably all cars which may be built in Japan will be small, leaving the field for larger cars to the American and European manufacturers, mainly on a basis of chassis importation with Japanese-built bodies. The delay in preparing drawings may be accounted for by the fact that the Japanese companies plan to model their cars after typical small American cars, that is, those that sell in America for \$1,000 or less.

(To be continued)





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## Standardization of Brake-Shaft Bushings

THERE has been a very apparent slow-up in the standardization work of the Society of Automotive Engineers of late, which is perhaps natural in view of the fact that a very large percentage of firms in the automotive industry were engaged on Government work and the various classes of equipment required by the Government had been pretty well standardized. However, now that the thoughts of all are again turning to peace-time production new opportunities will be afforded the Standards Committee to serve the industry in standardizing parts of automotive machinery that are ripe for such procedure.

For some time there has been an increasing use of oilless bushings on brake shafts, that is, the shafts carrying the cams or levers which serve to expand or contract the brake shoes or bands. Oilless bushings on these shafts offer a material advantage in that they obviate the need of refilling grease cups

in these relatively inaccessible positions and largely eliminate the wear that occurs if no provisions for lubrication are made.

The manufacture of bushings for this particular purpose has been hampered so far in that the lengths and diameters differed on every car. There should be no difficulty in making three sizes of bushings serve all requirements in passenger car and truck work, and we believe that the Standards Committee would do a valuable service to the whole industry if it were to take this matter up for consideration and formulate standards as soon as possible.

## The Outlook in the Tractor Industry

UNDER the curtailment regulation in respect to steel for tractor manufacturers, which went into effect on October 1 last, the scale of operation of each tractor firm for the coming year was closely limited. No factory which had any appreciable production last year would have been able to exceed 75 per cent of this production the coming year, and through the operation of the priorities system many would not have obtained enough material for even this reduced volume of output. With the ending of the war all these artificial restrictions of tractor production will be removed. The only limit on the total output will be the capacity of the market, or its estimated capacity, to absorb tractors, and as to the distribution of this output between different plants, it will be entirely a matter of free competition.

During the past year the demand for tractors considerably exceeded the production. This does not mean that every firm in the industry could have sold many more tractors than it produced, yet it is a fact that most of the well-established concerns were unable to meet the demands made upon them. This was especially noticeable among implement firms with an extensive distributing organization and only limited tractor manufacturing facilities.

There were three factors which helped to increase the demand for farm tractors last year. One was the unprecedented demand for farm produce and the resulting high prices for same. The next was the scarcity of farm labor, which was due to the draft and to the luring away of farm-help to munitions plants. The third factor was the marked improvement made in tractor design and construction during the past couple of years.

Of these three factors, the first and last at least will continue to operate the coming year. From all reports there will be a greater scarcity of food products than at any time during the war. Hence farmers will continue to receive good prices for their produce and will have every inducement to cultivate every available acre. Just how the farm labor situation will shape itself it is difficult to foretell. There will undoubtedly be a certain relief as the Army is demobilized and munitions factories are closed. But wages are not likely to come down very much for some time to come, and it will therefore

be to the farmer's advantage to save man power by adopting the most modern farm equipment. With a good three-plow tractor outfit one man can do at least twice as much plowing in a day as with a horse-drawn two-bottom plow, hence the item of labor cost in plowing is cut in half by the use of the tractor.

### Intensified Engineering Development Imperative

What is most necessary in order to keep the demand for tractors on the increase is continued, intensified engineering development. The tractor must be improved both as to its operating efficiency, so as to reduce the amount of fuel and oil consumed per acre plowed, and as to its resistance to wear and depreciation. At the present time an almost insignificant proportion of the farms of the country are equipped with tractors. With millions of farms in the country the possibilities are enormous. But before the farmers as a class can be induced to discard their horses and adopt the tractor instead, they must be convinced that the change will result to their economic advantage. Practically all conditions of farm operation have recently changed in a way favorable to the tractor. The high wages of farm labor, the high cost of horse feed and the need of devoting more of the acreage devoted to raising it to raising human food combine to make the outlook for the tractor more encouraging than at any time in the past.

## Commercialism in the Wrong Place

IT is probably impossible to carry through such a gigantic task as that which was involved in our air program without making serious mistakes. Now that the war is won and the program as a whole has proven successful it may seem malapropos to harp on blunders relating to details. Yet it must be remembered that there are many things which could not be mentioned in the public prints before, so that if they are worth discussing, now is the proper time to take them up.

We have recently had a chance to look through a book of instructions for the installation, inspection and maintenance of the Liberty aircraft engine, issued by the Equipment Division of the Signal Corps. One chapter of this book, after describing the battery ignition system specially designed for this engine, enumerates a list of "advantages which this type of ignition presents over the magneto system."

Now, it is difficult to see how a knowledge of the advantages of the ignition system used, as compared with a rival system, will help the mechanic in "installing, inspecting and maintaining" the system used. The section referred to is nothing more or less than an enumeration of sales arguments or talking points, which has no proper place in an instruction book. What makes things worse is that some of the statements made are absolutely misleading, if not untrue. Thus, it is given as one of the advantages

of the Liberty system over the magneto system that the distributor heads of the former "run at slow speed (one-half crankshaft speed), hence the wear will be slight." Now, the distributor of a magneto, the same as that of a battery system, runs at one-half crankshaft speed, if the system is for a four-cycle engine like the Liberty.

Another advantage of the Liberty ignition system over the magneto system is said to be that the spark of the former "is hot and of short duration," from which it may be inferred that that of the latter is cold and long drawn out. It is very much to be doubted whether anybody ever measured the temperature of a spark and is in position to say that one spark is hotter than another.

This, however, is only by the way. The point is that the inclusion of such matter in a Government publication for the instruction of mechanics is an indiscretion of the worst sort, and on reading it one begins to understand the rancorous feeling that has been aroused in sections of the ignition industry by some of the things that have been done by people connected with the aircraft department.

## Maintain Americanism

NOW that the war is practically over, it is to be hoped that the marked impetus given to the "Americanization" movement will not be allowed to perish in the struggle of commercialism. If this war has taught the country anything, it is that our people must not only be citizens, but they must also be Americans. The English language should be as nearly universal in this country as it is possible to make it and we must do everything in our power to avoid the formation of virtual foreign colonies in our midst.

The Germans were highly indignant because the so-called German-Americans did not prove solidly loyal to the Fatherland. They would have been spared this disappointment and we would have been spared a great amount of trouble with a larger element than was comfortable, if such a thing as organized hyphenism had never been permitted to grow.

### American Workmen Should Be Given Preference

In our shops, preference should be given Americans. The emigrant should be encouraged to take out his papers and everything that can be consistently done to make him an educated, English-speaking citizen should be done. This will not only be doing a great work for the country, but it will also be making for a more efficient shop. The public school is working on the next generation. The shop works with this generation as well as the next.

Small shops cannot go as far in this as larger shops can. Here the work can be taken up collectively, through the agency of the Board of Commerce or some similar community organization. It is one of the most important situations which confront the nation to-day, and to do your bit in this in peace times is just as important as it was to have done your bit when war was here.



# □ Latest News of the

## Government Should Let Business Set Reconstruction Pace

**Five Thousand Delegates at Atlantic City Congress Enthusiastically Endorse the Principle That Readjustment of Commercial Activities Is a Function of Business and That Government Should Follow Business, Not Lead It, in Its Task**

ATLANTIC CITY, N. J., Dec. 4—Special Telegram—More than 5000 delegates representing the foremost business interests of the United States to-day vigorously applauded the principle that the readjustment of business policies and activities is logically a function of business and that the Government should follow business and not lead it in the task. The convention, which is a reconstruction conference of three hundred and eighty-one war service committees, representing as many industries, formally opened to-day under the auspices of the Chamber of Commerce of the United States. The meetings are being held at Young's Million Dollar Pier, and the initial gathering, which heard such eminent authorities on business as Charles M. Schwab, Secretary of Commerce William C. Redfield, and Harry A. Wheeler, president of the United States Chamber of Commerce, packed the great hall to capacity.

The convention undoubtedly is the most important gathering of its kind that has ever been held and it is certain that the results of the deliberations of the five thousand delegates which will be made public in a series of resolutions at the last of the session on Friday will have a profound effect in guiding and shaping the reconstruction and readjustment policies of the business world.

### Comprehensive Road Program Favored

The economic importance of an uninterrupted policy with regard to public works and particularly in the building and maintenance of national highways is one of sustaining interest to the convention. The hearty applause which greeted both Charles M. Schwab and Secretary Redfield when they separately advocated

the necessity of a comprehensive road program in order that the fullest possible use may be made of highway transportation leaves no room for doubt regarding the sentiment of the gathering on this point. Individual recommendations to this effect have been adopted by nearly every separate war service committee.

And at a meeting of the War Service Committee on Highways a resolution was adopted strongly urging "the immediate creation of a separate and distinct Federal Highways Commission, whose duties it shall be to construct and maintain a system of national highways and that appropriations be made therefor." At the meeting of the War Service Committee of the automobile industry a similar sentiment was apparent, and the members went on record as favoring a continued road program to facilitate and stimulate highway transportation.

### Advocates Commission Be Sent to Paris

Harry A. Wheeler touched a responsive chord at the opening session to-day when he advocated that a commission of business men be sent to France to be available for consultation in the solution of such problems affecting American business as may be expected to come before the peace conference.

"Counsel can hardly be taken except where minds meet and personalities come in contact with each other. The counsel of statistics cannot adequately represent American business," said Wheeler. "Since in questions of economic reconstruction other nations will undoubtedly be adequately represented with the most expert support that can be marshalled, it is for you to determine whether you regard the matter of sufficient importance to advocate the appointment of a commission whose continuous presence in Paris will provide like representation on behalf of American industry."

Touching on the matter of war con-

tracts, Wheeler advocated a liberal policy on the part of the Government in cancellations. "There must be," he said, "a willingness to retain possession of the materials owned and controlled, releasing them only so fast as the market can readily absorb these commodities without breaking prices to an unwarranted extent or stopping production during the period required to digest Government controlled stocks.

"It is vital, however, that such adjustments be made as far as possible before those representatives of the Government who placed the contracts have returned to their private concerns, as only these have knowledge of the circumstances under which the work was undertaken, and who have some sympathetic consideration for the difficulties which confront a converted plant in the reconversion to its normal uses. No substitute adjusting medium can ever accurately and justly determine the measure of damage to plant, or the true value of materials bought solely for other purposes at anything like their invoice cost."

A similar feeling prevailed at the meeting of the War Service Committee of the automobile industry. Here it was reiterated that it was manifestly unfair to subject a manufacturer to a market glutted through no action of his own but through the unrestricted sale of Government owned products. Such products, it was pointed out, should be sold abroad where they would assist our Allies in getting on their feet.

### Optimistic Over Labor Readjustment

Neither Secretary Redfield nor Charles M. Schwab expressed any apprehensions regarding labor during the present reconstruction period. Both believe that there will be no period of unemployment, that our factories will absorb workers as quickly as they are released from mili-

(Continued on page 979)

# Automotive Industries

## Detroit Automotive Conditions

### Unsettled as Regards Getting Back to Normal Production—Price Trend Doubtful

DETROIT, Dec. 3—Conditions here still are unsettled as regards the time when the motor car factories will get back onto a normal basis of production and also as to what prices are going to be. The time when normal production will be reached will depend upon the extent to which factories were on a 100 per cent war basis and upon the ease with which materials may be secured. Some of the factories were on a 100 per cent war basis, while others were working in that direction, with the expectation of being so by the first of the coming year. Manifestly, these latter companies, other things being equal, will be able to resume normal production sooner than will the former. The general impression prevails that it will be several months in coming.

No material changes in the price situation have taken place during the last week. Reductions, or rather a return to price conditions of early last fall, will be made by one or two concerns which are not, however, ready to make public announcement of their intentions just at this time. These contemplated reductions hardly will affect the situation seriously, it is believed.

The worst feature of the price situation, from the viewpoint of the concerns which have already announced that no changes are imminent, or which have no intention of making a change, is the psychological effect upon the dealers of the reductions already announced. It is feared that there will be engendered in the minds of the dealers as a class the expectation that prices in general will come down, with the effect of slowing up business for the next 90 days.

But that price reductions will be generally resorted to is regarded as highly improbable. Some of the larger concerns already have stated positively that no changes will be made, and as far as this goes it will have a counter effect on dealers and will tend to stabilize the situation.

There is no intimation of a downward tendency in prices on motor trucks. The truck manufacturers anticipate a big demand for trucks for industrial and farm purposes, and with labor and material conditions as they are they profess to regard lower prices as an impossibility. Indeed, some of the truck manufacturers

are inclined to take the other angle and assert that if any movement of prices is manifested it will be upward rather than downward.

### N. A. A. J. to Hold Convention

CHICAGO, Dec. 2—The National Association of Automobile Accessory Jobbers will hold a convention Dec. 16, 17 and 18 in this city. It had scheduled a convention and exhibit for about Nov. 1, but dropped its plans at the request of the War Industries Board.

The directors and committees will meet the 16th, which is Monday, and the general sessions will be held the 17th and 18th. The usual practice had been to hold the convention for an entire week, and such would have been the case had not the exhibit been discontinued.

## Detroit S. A. E. Sees Liberty Engine Manufacture

### Record Attendance Brought Out by Ford Reels and Lecture on Aerial Warfare

DETROIT, Nov. 30—The convention hall of the Pontchartrain Hotel was crowded to capacity last night to accommodate the great crowd which came to attend the third fall meeting of the Detroit Section, S. A. E. The program for the evening consisted of a moving picture portrayal of the manufacture of Liberty motors in the Ford plant, followed by an illustrated lecture on Aircraft Warfare by G. Douglas Wardrop, managing editor Aerial Age Weekly.

The Ford film was intensely interesting. The manufacture of Liberty motors was followed through from the raw materials to the finished aircraft. The wonderful machinery which is used in the manufacture of motors, the speed and precision of manufacture and the careful inspection of every process were depicted in full.

Mr. Wardrop's illustrated lecture was no less interesting. Recently returned from England and the Flanders front, where he had the privilege of investigating the use of aircraft in war activities, accompanied by the experience of being a companion in the flight of some of the noted airmen, the speaker was enabled to invest the story with what he said was a personal and intimate touch, which made his story stand out vividly. The pictures, too, with which the lecture was

## 1918 Car and Truck Production

### Passenger Cars Show Big Drop; Commercial Cars Have Increased

WASHINGTON, Dec. 2—Production of passenger cars and trucks, by quarters, for 1918 is as follows:

	Passenger Cars	Commercial Cars (Civilian only)
First quarter.....	293,333	45,500
Second quarter.....	345,100	45,417
Third quarter.....	186,173	45,429
*Fourth quarter.....	150,900	46,300
Total .....	974,606	182,646

\*Estimated.

In 1917 there were produced 1,718,000 passenger automobiles and 160,000 commercial motor vehicles, whereas under the war restrictions this year the total output of passenger cars will be slightly less than 1,000,000, or 740,000 fewer than in 1917. There was no enforced limitation of truck production until last August, except that many assemblers were unable to obtain deliveries of engines, transmissions and axles. Trucks produced and sold for civilian use only last year totalled 109,000, while this year they will reach 182,000—an increase of 67 per cent.

### Saxon Price Reduced

DETROIT, Dec. 4—The Saxon Motor Car Corp. has reduced the price of its 6-cylinder passenger car from \$1,295 to \$1,195, effective at once.

### Decreased Appropriation for Air Service

WASHINGTON, Dec. 2—Appropriations for the current year submitted to Congress by Secretary McAdoo to-day included \$144,943,000 for the Air Service as against \$760,000,000 last year.

illustrated, were of a nature to give the observers a better understanding of the important part aircraft had played in the great war than many had heretofore had an opportunity to gain. Particularly interesting were the illustrations of all the various types of aircraft machines at present in use.

The lecture concluded with some prophecies for the use of aircraft in times of peace which would have sounded wildly Utopian just a little while ago, but which appeared very probable in view of the marvelous advances which have been achieved under the stimulus of war.



## Coast to Coast Air Mail Route

New York - San Francisco Service Planned with Feeder Lines to All Important Cities

WASHINGTON, Nov. 29—The inauguration of an aerial mail service between New York and San Francisco with feeder lines to all the important cities between those points is certain to follow the signing of the peace terms.

The Post Office Department plans to ask appropriations of \$1,500,000 and possibly more for this work. In addition to the postal service the Navy plans to continue and develop mail service between its various stations and Naval hydroplanes may also be used by the Post Office for mail flights over water routes.

It is possible that one route will be established over the Mississippi River, connecting New Orleans, Memphis, St. Louis and St. Paul on the Mississippi River; St. Louis, Jefferson City, Kansas City and Omaha on the Missouri River, and Louisville and Cincinnati on the Ohio River. Another route will likely extend up the Hudson River valley, connecting New York City with Albany and other up-State points.

That there will be an extension of the Air Mail Service to include Denver was indicated in a telegram from Postmaster-General Burleson to Senator John F. Shafroth of Colorado, stating:

Referring to conferences with you relative to extension Aerial Mail Service to Colorado points, I have directed the extension immediately after the war of Aerial Mail Service to Denver in connection with the transcontinental route from New York to San Francisco.

Mr. Burleson has announced that the New York-Chicago air mail route will start some time before Dec. 15, the exact date depending upon the receipt of necessary airplanes. Work is in progress on the hangars at Woodland Hills Park, Cleveland; Bryan, Ohio, and at Clarion, Bellefonte and Lehigh, Pa. The hangars will be ready for use Dec. 1. The winter plan of operation is for trips from Chicago and New York, starting at 6 a. m. and including all stops to be made within 10 hours. It is expected that approximately 20,000 letters will be carried daily.

Preparations have been made to insure successful service through the winter months. Electrically-heated clothing for the pilots and individual heating plants for each plane form a part of the program. The heating plants will keep the engines warm in the hangars through the coldest weather and allow immediate starting. Landing and take-off areas will be well packed during snow time and equipment has been devised for the control of planes on sleet and ice. The New York-Chicago airplanes will be equipped with wireless.

That the service has proven efficient up to this time was stated recently in a

public announcement issued by the department, adding further that it has proven the possibility of further extension and the value of the saving in time which may be accomplished by the use of the airplane for the transportation of mail, the benefit being in accumulating ratio as the distance covered is increased. In future extensions, when war conditions permit of this, there will be nothing experimental. That the Air Mail Service has progressed beyond the state of experiment is shown by the following figures:

During August there were 27 flying days, 108 legs of journey being made. In making these 108 flights there were only two forced landings, one causing a delay of 17 min., the other of 10 min. Of the total mileage to be flown, 11,961 miles, 11,957 were actually completed.

The record for the month of September and for October was 100 per cent perfect, according to the Post Office Department.

The Post Office appropriation bill passed by Congress permits the War Department to turn over the airplanes to the Post Office as requisitioned and without charge, and it is expected that a large number of planes and considerable equipment will be turned over to the postal authorities, and that the \$1,500,000 appropriation will be used exclusively for maintenance cost.

### Naval Pilots Use Parachutes

WASHINGTON, Nov. 29—Two Naval aviators dropped from more than 3000 ft. from swiftly moving seaplanes flying over this city yesterday by means of parachutes and made successful landings. Ten minutes were consumed in the descent.

### A Three-Stop Transcontinental Air Service Predicted

WASHINGTON, Dec. 2—From New York to San Francisco by air with three stops, Chicago, Denver and Salt Lake City, will be a commonplace flight soon.

That non-stop air mail service between Chicago and New York is not only a possibility but a certainty was demonstrated last week, when non-stop flights, Dayton to New York, 550 miles, consuming one-half of the gasoline supply, and Mt. Clemens, Mich., to New York City without use of the extra gasoline supply, proved conclusively that the post office plan of service between New York and Chicago is a sane one, and that the present scheme which contemplates landing places between these points is particularly conservative. The DeHaviland-4 Army planes have displayed their ability to make 850-mile flights without stopping.

In fact, judging by the numerous non-stop records announced, it is a safe prediction that mail from New York to San Francisco by air with three stops, at Chicago, Denver and Salt Lake City, will be a regular occurrence before 1920.

## Plan 21 Naval Aerial Stations

Coastal Patrol Would Include 4 Zeppelins, 12 Dirigibles and 144 Smaller Balloons

WASHINGTON, Nov. 29—The establishment of a coastal air patrol to include four Zeppelin-type airships, twelve dirigibles and 144 smaller balloons was discussed by naval officers before the House Naval Affairs Committee to-day. The Navy intends to pay \$1,500,000 each for the Zeppelin-type of airships. The dirigibles will cost \$250,000 each and the smaller balloons \$75,000 each. The Navy will also buy 108 fighting escort planes.

During the discussion it was said that \$90,000,000 of the \$220,000,000 appropriated for Naval aviation will be returned to the Treasury in July, 1919, as "unnecessary." Rear-Admiral Taylor, Chief of Naval Construction, described the work of the Zeppelins, telling that during the war one of these airships flew from Germany to German East Africa.

### Navy Asks Aid from Congress

The Navy urgently requests the aid of Congress in the establishment of aerial coastal defenses. Officers testify that with proper defense the U boats which appeared off the American shores last year would have been unable to do any damage and would probably have been destroyed.

The discovery of a non-inflammable balloon gas was announced and pronounced so efficient that it could be fired into the gas bag without igniting. The gas costs more than hydrogen but leaks less rapidly, thus evening up the final cost.

Twenty-one aerial stations are planned, some of which are under construction. They will command the Gulf, Pacific and Atlantic coasts and insular possessions, and will be established on the Maine coast near Portland, Narragansett Bay, New York harbor, Port Arthur, Texas; San Francisco; Seward, Alaska; Guam and St. Thomas, West Indies; Hawaii and the Panama Canal Zone. Stations under construction are at Camp Lookout, N. C.; Brunswick, Ga.; Galveston, Texas. Completed stations are at Chatham, Mass.; Rockaway Beach, N. Y.; Key West, Fla.; Miami, Fla.; San Diego, Cal.

### Plane Capable of 160 M.P.H.

Further discussion by Admiral Taylor confirmed the reports current in Washington of a plane capable of 160 m.p.h. Admiral Taylor told that experiments with a Kirkham triplane had resulted in the speed of 160 m.p.h. It is reported here that this plane has been developed by the Curtiss Engineering Co.

It is also stated that \$36,000,000 worth of contracts for Naval airplane service have been canceled since the armistice was signed.

## Non-Stop Flight Records Broken

A Standard De Haviland-4 Plane with Liberty 12 Engine Travels 550 Miles

WASHINGTON, Dec. 2—Making a dinner and theater engagement in New York City at 10 a. m. from Dayton, and arriving to keep the engagement for the same day, was what C. F. Kettering, vice-president of the Dayton-Wright Airplane Co., and H. M. Rinehart, premier pilot of that company, accomplished late last week, at the same time breaking all non-stop airplane flight records in the United States. The trip was made in a standard DeHaviland-4 plane equipped with a Liberty 12 engine, and the journey of 550 miles was accomplished in 4 hr. 10 min., an average of 134 m.p.h. When Mineola, Long Island, was reached there was enough oil and gasoline in the tanks to carry the machine back to Dayton, and Mr. Rinehart thought a 1000-mile non-stop journey with a DeHaviland-4 should be a comparatively simple matter.

### Leaves Dayton 11 A. M.

The journey was made leaving Dayton at 11 a. m. Saturday, just following receipt of orders to bring a DeHaviland-4 plane to Washington. Mr. Kettering, who was desirous of going to New York, suggested that the journey be made via New York, stopping there for dinner and a show, and then going on to Washington. At exactly 11 a. m. the machine arose in the air. At 3.10 p. m. it landed on Mineola Field. The aviators kept their dinner and theater engagement. At 2.05 p. m. yesterday afternoon the fliers started for Washington. At 4.10 they stepped from their plane in front of the hangars on Bolling Field, covering the distance of 224 miles in 2 hr. 5 min.

Mr. Rinehart stated that on the trip from Dayton to New York and New York to Washington an altitude of 5000 ft. was maintained, and at no time did he go more than 5 miles off the air line course.

### Seaplane Carries 50 Passengers

WASHINGTON, Dec. 2—All records for carrying a large number of passengers in any type of airplane were broken Wednesday, Nov. 27, at the Naval Air Station, Rockaway, when the Navy's newest type of seaplane, the giant NC-1, the largest seaplane in the world, made a flight with 50 men on board. Most of the men were accommodated in the large boat body.

The design and the construction of the NC-1, with its triple motors, huge size and other distinctive features, was carried out by the Navy in co-operation with the Curtiss Engineering Corp. It is not specifically a flying boat nor is it of the pontoon variety of seaplane, but combines the most valuable advantages of

both, its size and purpose being considered. While it is entirely new and original in type, the NC-1 incorporates proven essentials in aircraft construction, and even before it was tested was regarded in naval circles as a pre-insured success rather than as an experiment.

This is the first American tri-motored seaplane, being propelled by 3 Liberty motors that develop a maximum of 1200 hp., giving it a cruising speed of 80 m.p.h. The flying weight of the machine is 22,000 lb., while the weight of the seaplane itself, unloaded and without a crew, is 13,000 lb.

An idea of the size of the big seaplane is shown by the fact that the wing spread is 126 ft., the breadth of wing 12 ft., and the gap between wings 12 ft.

Recently the NC-1 made the trip from Rockaway to Washington, about 350 miles, in 5 hours and 20 minutes. The flight from Washington to Hampton Roads, 150 miles, was covered in 2 hours and 15 minutes, and the trip from Hampton Roads to New York, 300 miles, took 4 hours and 20 minutes.

### Praises John D. Ryan

WASHINGTON, Nov. 29—That the aircraft program had already succeeded when Howard Coffin resigned and John D. Ryan was appointed as head of the Air Service was indicated in correspondence between President Wilson and Mr. Ryan, in which the latter was thanked for his service and for the management which speedily established the public confidence. The President's letter recognized Mr. Ryan's desire to return to industrial work and added:

The aircraft program was in all likelihood proceeding toward success but the energy of your management and the broad business experience which you brought into the Air Service speedily established the whole thing in the public confidence and gave the country full assurance that our participation in the war through the Air Service would be in keeping with our responsibilities and resources.

### Department of Labor Reorganized

WASHINGTON, Nov. 29—The Department of Labor will be reorganized from a war to a peace basis by a committee appointed by Secretary of Labor Wilson, and including Louis F. Post, Assistant Secretary of Labor, chairman; A. W. Parker, Bureau of Immigration; Roger W. Babson, Director of the Education Service; Mary Van Kleeck, Director of the Woman Industries Service, and Grant Hamilton, Director of the Working Conditions Service. The department now has two services and eight boards created during the war, and the committee will decide upon the conversion of some of the boards and the elimination of others. Those to be converted, as for example the United States Employment Service, which has 900 branch offices and 4400 employees, will probably be expanded to meet the exigencies arising from demobilization.

## Australia in Need of Farm Tractors

Much Interest Displayed in First Official Field Trials at Melbourne

SYDNEY, N. S. W., Oct. 12—S. L. Tyler, a director of McIntosh & Sons, Ltd., Buick distributors, states that the demand for farm tractors is increasing rapidly, and that the first field trials held under the auspices of the Federal Government were carried out so successfully that interest was greatly stimulated as to the possibilities offered by power farming.

Experiments are being conducted with a suction gas generator designed to eliminate the use of gasoline as a fuel. These have proved satisfactory, according to Mr. Tyler.

Whether the passenger car dealer will handle the farm tractor or not seems to be a point under consideration, as in Australia it has been found that a dealer cannot, as a rule, sell both cars and trucks satisfactorily. In the case of the larger firms, such as McIntosh & Sons, it is likely that subsidiary companies will be formed for the express purpose of handling tractors.

The Commonwealth of Australia is a very large grower of wheat and other grain, and improved shipping conditions are practically certain to further increase production.

### Will Market Liberty Fuel Jan. 1

WASHINGTON, Dec. 2—The new motor power called Liberty fuel will be sold to the general public by Jan. 1, according to a new announcement by Capt. E. C. Weisgerber, the inventor. The base of the new fuel is said to be kerosene. The invention has been patented and according to the regulations of the War Department the inventor may make it a commodity for public use. Three thousand gallons are reported to have been manufactured to date, this amount being used largely for experimental purposes. It is said that the new motor gas is composed of 80 per cent kerosene, the balance being chemicals that constitute the essentials of the discovery.

The price of the new fuel has not been fixed, but it is stated that the ingredients other than kerosene are of low cost and can be obtained readily.

### Makes 500-Mile Non-Stop Flight

WASHINGTON, Dec. 2—Major N. J. Boots, Army pilot, made a non-stop flight of 500 miles from Mt. Clemens, Mich., to New York City last week in 4 hours and 30 minutes. He used a Fisher Body Co. DeHaviland 4 with a Liberty engine and one extra 25-gal. gasoline tank. An altitude of 8000 ft. was reached between Buffalo and New York City. The supply of gasoline in the extra tank was not used.



## Export Product List Revised

### Tires and All Manufactured Rubber Articles Can Be Shipped; Not Crude Rubber

WASHINGTON, Nov. 29—All manufactured rubber articles, including automobile tires, have been removed from the export conservation list and can now be shipped to all destinations. Crude rubber cannot be exported from this country. Numerous other commodities are removed from the list and can be exported generally. These include the following:

Alloys containing tin.  
Anti-friction metal, bars and pigs and all shapes, unless an integral part of a complete machine.  
Babbitt metal, bars and pigs and all shapes, unless an integral part of a complete machine.  
Anti-friction bearings, unless an integral part of a complete machine.  
Babbitt bearings, unless an integral part of a complete machine.  
Bichloride of tin.  
Oil cans, second-hand crushed.  
Oil squirt cans.  
Chloride of tin.  
Founts, lamp, tin.  
Lamp founts, tin.  
Lanterns, tin.  
Anti-friction metals.  
Babbitt metals.  
Type metals.  
White metals.  
Oxide of tin.  
Phosphorized tin.  
Any metallic alloy containing tin.  
Bichloride of tin.  
Bottle caps or covers of tin foil.  
Chloride of tin.  
Collapsible tubes.  
Crown corks.  
Compounds of tin.  
Crystals.  
Oxide.  
Salts.  
Silverware containing tin.  
Carbon Tetrachloride.  
Wire tin.  
Aeronautical instruments.  
Aeronautical machines, their parts and accessories.  
Anti-aircraft instruments, apparatus and accessories.  
Boring machines, horizontal and vertical.  
All iron and steel chains, either welded, case or stamped.  
Chronometers.  
Chucks, drill.  
Chucks, lathe.  
Circular-saw blades.  
Engines, marine, and parts (individual licenses not required to Canada and Newfoundland for engines of 60 hp. and under).  
Machine tools, as follows:  
Grinders, internal, plain and universal.  
Horizontal and vertical boring machines.  
Lathes, all sizes.  
Milling machines, plain and universal (except hand millers).  
Planers.  
Radial drilling machines.  
Slotters.  
Vertical boring mills, all sizes.  
Machines as follows:  
Boring, horizontal and vertical.  
Milling, plain and universal (except hand millers).  
Drilling, radial.  
Micrometers.  
Presses, hydraulic.  
Pyrometers, equipment and thermocouples.  
Tachometers.  
Tools, as follows:  
Calipers, drill chucks, drills, files, abrasive (see Files), lathe chucks, micrometers, reamers, saw blades, circular, hack and band.  
Twist drills.  
Vertical boring machines.  
Vertical boring mills, all sizes.  
Alloy steel.  
Bars, iron and steel.  
Bars, iron and steel (including flats 6 in. wide and narrower).

Cable (iron and steel consisting of 6 wires or more).  
Casing, oil well (frequently described as "boring tubes").  
Cast-iron pipe.  
Fabricated structural steel, iron and steel, including angles, channels, beams, tees and zeos, and plates  $\frac{1}{4}$  in. thick and heavier, punched or shaped, including tanks made of plates  $\frac{1}{4}$  in. thick and heavier.  
Boiler tubes.  
Sheets less than  $\frac{1}{4}$  in. thick.  
Tool steel.  
Wire.  
Formic acid.  
Hydrochloric acid.  
Muriatic acid.  
Chemical compounds of manganese.  
Chemical compounds of tungsten.

### American Farm Tractor Demonstrated in Uruguay

WASHINGTON, Dec. 3—A trial exhibition of an American tractor at Montevideo, Uruguay, reported by the American consul there as taking place early in October, attracted considerable attention in interested circles. The exhibition consisted in plowing to a depth of 4.7 and 7 in. and at a speed of from 2.5 to 3.1 m.p.h., harrowing and free running. It is estimated that the tractor can plow 10 acres in an 8-hr. day with a consumption of 5.8 gals. of kerosene per 2.471 acres. The make of tractor was not named in the report, which stated that it was offered for sale completely equipped in Uruguay for \$1,447.

### N. A. C. C. Confers with Dealers on Shows

NEW YORK, Dec. 5—At yesterday's meeting of the directors of National Automobile Chamber of Commerce a committee was appointed composed of C. C. Hanch, J. Walter Drake and S. A. Miles to confer with the representatives of the New York and Chicago automobile trade associations in connection with the local automobile shows which the dealers propose to hold in those cities early in 1919. Henry Paulman and G. M. Allison attended for the Chicago Automobile Trade Association, and Chas. H. Larsen, R. J. Gilmore and Chas. H. Stewart for the New York Dealers' Association. Announcement of the result of their deliberations is promised within two or three days.

### President Exonerates Vincent of Improper Intentions

WASHINGTON, Dec. 4Lt. Col. Jesse C. Vincent, one of the designers of the Liberty airplane engine and formerly vice-president of the Packard Motor Car Co. and George W. Mixer, both army officers named by Charles E. Hughes in his report on the aircraft investigation as having violated a code, have been found completely innocent of any intentional wrong doing by Attorney General Gregory, and his recommendation that they be pardoned has been acted upon by President Wilson, according to an announcement from the White House last night. Col. Vincent, it was said by Attorney General Gregory, "rendered invaluable service in designing and perfecting the Liberty engine." He acted in entire good faith and took no advantage of the Government, said Mr. Gregory.

## An Aerial Weather Forecast

### Bureau Issues First Report of Conditions in Co-operation with Mail Service

WASHINGTON, Dec. 3—The first aerial weather forecast to be issued in the history of the United States was made public last night by the Weather Bureau, in co-operation with the aerial mail service of the Post Office Department. The forecast marks a new phase of aviation. It is as follows:

"New York to Cleveland. Cloudy 8 p. m. Snow near Lake Erie. Winds moderate northwest to north-northwest east of the Alleghenies up to 6500 ft. and moderate south winds west of Alleghenies shifting to west-southwest at about 1500 ft. Forecast: Snow Monday, with increasing northeast to north winds up to about 6000 ft., backing to strong northwest above.

This forecast was wired to the Aerial Mail Field, Woodland Hills Park, Cleveland, and the intention is to extend the service as aerial mail routes are lengthened.

"The forecast," said Otto Praeger, Second Assistant Postmaster General in charge of aerial mail, "enables the department to lay its plans on a scientific basis and assures a greater degree of success than would otherwise be possible. The Weather Bureau undertook this new research on its own initiative. Dr. Charles F. Marvin, chief of the Weather Bureau, and a member of the National Advisory Committee for Aeronautics, saw while the war was on that it would be impossible to develop the airplane commercially in time of peace without meteorological guidance so as to overcome adverse conditions on long-distance flights. This forecast is the result."

### Plans Extension of Service

The Postoffice Department is rapidly completing its plans for an extension of the service so that on December 15 daily airplane mails will be run between New York and Chicago. Experiences demonstrate that this service can be operated with greater economy as the lines are extended, and so the department is able to announce, for the New York-Chicago service, a reduction in the rate of postage from 16 cents an ounce or fraction thereof to 6 cents. This applies to sealed parcels, not exceeding 30 inches in length and girth combined, as well as the letters. The old rate of 16 cents on the first ounce allowed 10 cents for special delivery service. Under the new rate it is left optional to the sender of a letter whether he desires to place a special delivery stamp on his aeroplane mail. This places the aeroplane rate on the same basis as all other letter mail.

On the New York-Chicago route all mail stops are made in ample time to catch the regular carrier delivery, insuring the delivery of the letter that day, and making it unnecessary to apply special delivery unless the sender desires immediate expedition of the letter upon its arrival in the city of address. Faster machines, beginning December 15, will also be placed on the New York-Washington route, insuring arrival of the mail for the regular carrier delivery in Washington and New York on the day of arrival.

Special aeroplane postage stamps or ordinary postage stamps may be used. When ordinary postage stamps are used the mail should be endorsed "By Aeroplane." If special delivery service is desired, a special delivery stamp or its equivalent in ordinary postage stamps must be placed on the mail in addition to the 6 cents air postage. If ordinary postage stamps are used in place of the special delivery stamp, the mail should be endorsed "Special Delivery."

# Government Should Let Business Set Reconstruction Pace

(Continued from page 974)

tary duties. Schwab came out flatly in favor of labor organization but with the proviso that such organization should be local to a given plant with the control of the body vested in local hands rather than in the hands of some national body which knows little of actual conditions probably thousands of miles from national headquarters.

## No Room for Pessimist To-day

There is not even standing room for the pessimist in American business to-day, said David L. Ludlum, in opening the meeting of the automobile group, and his statement was very ably backed up by George M. Graham, president of the Pierce-Arrow Motor Car Co., who stated that business faces a period of unprecedented prosperity.

With the practical dislocation of foreign trade Mr. Graham pointed out that dealers in the United States are given an unparalleled opportunity. Hand in hand with the opportunity of the dealer go the prosperity of the maker and the contentment of labor. Upon the ability of the dealer to distribute the product depends the ability of the maker to keep his plant busy and thus to keep his workers fully employed.

During 1917 there was a total of 1,718,000 vehicles marketed in the United States. The possible market in 1918 was 2,000,000 vehicles. Against these figures the actual conditions reveal that during the present year manufacturers of passenger cars and motor trucks have sold only 50 per cent of their market, and during this time they have been operating against the additional handicap of attempting to convert their business to 100 per cent war work.

With relation to cancellation of Government contracts, Graham deplored the excessively rapid action of the Government and stated that there was little that could be done now to alleviate conditions which might not have come to pass had the Government heeded the suggestions which it sought from the industry, but which it subsequently discarded. When the matter of contract cancellation first came up the automobile industry was requested to consult with Government authorities and to offer such recommendations as in its opinion would operate to the best advantage of all concerned. Motor vehicle makers, in approaching this problem, made only one request of the Government. That was that the Government adjust cancellations with this one thought in mind—"in what period of time can manufacturers turn from a war basis to a peace basis without creating conditions of unwarranted unemployment."

## Industry Will Readjust Itself

It is Graham's opinion that the automobile industry can and will readjust itself to a peace production basis without outside assistance. Despite disrupted manufacturing conditions, and

with sales organizations in many cases completely torn down, the sentiment still prevails in the industry that some of the manufacturers will get out. In consequence it is believed that the best policy will be to urge that the industry be left severely alone to follow its own problem.

It is believed that the 30,000 motor vehicle dealers of the country have sufficient enterprise, courage and zeal to put the industry back in its proper place in the sun.

"Motor car and motor truck dealers must by merchandising and salesmanship replace the domestic business that has been taken by war business," said Graham.

## Does Not Anticipate Disruption of Market

Graham offered as his opinion that there will be no disruption of domestic markets through the sale in the United States of trucks now owned and operated by the Government in France and England. It is not regarded as likely that the governments of our allies or that of the United States will permit trucks at present in use on the other side of the sea ever to come back to America. At present they are desperately needed for the transportation of food. With winter coming on, when railroads are demoralized and the waterways frozen solid and rendered useless, it is estimated that thousands of persons would literally starve to death for the lack of transportation facilities alone.

It is the belief, said Graham, that the trucks at present in use abroad will be held there. Trucks owned and operated by the Government in the United States will in all probability continue to be so owned and operated. It is likely that many thousands of army vehicles will be used for a long time at the various cantonments, that hundreds will be turned over to the postal authorities for the use of the post office, and there is a possibility that the railroads may be induced to take up the use of motor trucks as a means to relieve the rail carriers of short haul work.

## Against Restrictive Measures

Graham is uncontroversibly against restrictive measures of any and all natures. He believes that the motor car industry must have a fair chance under normal competitive conditions to work out its own conservations and that the industry should not be controlled except by itself.

With regard to our merchant marine, the committee adopted a resolution which if put in force would go far to eliminate the possibility of a glutted market. It is urged that regardless of who may operate a merchant marine, makers, who have materials and unfinished products for which the Government has no use, be given the first opportunity to sell such products abroad through the medium of shipping provided by an American mercantile fleet.

The oil industry went on record to-night as against federal roadbuilding but favoring the construction and maintenance of highways under local supervision and by local and state taxation. This was something of a surprise, as most of the other 300 industries officially represented at Atlantic City have or will urge a strong federal roadbuilding program under a special cabinet officer.

The action was taken in the form of a resolution adopted by the group meeting of the oil and oil products group under the chairmanship of A. C. Bedford, chairman of the Standard Oil Co. of New Jersey. The resolution opposed the building of highways by the federal government until the constitution is changed giving more power to the highways commission and urging that for the present, highways be built and the roads to be improved be selected by the localities involved.

Other resolutions urged the National Petroleum War Service Committee to form a national association of the petroleum industry, and indorsed the attitude of the American government in protesting against any confiscation of American property in Mexico.

The surprising highway resolution followed a talk by Van H. Manning, of the Bureau of Mines, who, in telling of the possibilities of fuel conservation in the future and in pointing out ways in which the oil industry could improve its methods, stated that from 50 to 75 per cent of all the oil in the ground fails to reach the surface, being lost in the sands, etc. Another field of research which was pointed out as looking to a more complete use of the crude supplies is in the improvement in cracking oils to get their lighter constituents.

## Development of Oil Shales

Director Manning also pointed out the need of developing the enormous reserves of oil in the oil shales, but warned that such work was not one which could be engaged in without large capital or with the expectation of immediate dividends.

For years, he said, the United States has supplied two-thirds of the world's supply of petroleum. If transportation and other facilities were as good in other countries, among them Mexico, South America, and India, the world's output could be greatly increased. The American oil industry, he urged, must play a part in developing these foreign fields. He told the oil men that their industry had nothing to conceal and urged them to take the public into their confidence.

He complimented the oil industry for its part in the winning of the war and stated his pride in the American citizen for the way in which the public responded to the gasless Sunday request and other conservation measures. So valuable was this, he said, that a famous British admiral remarked: "We floated to victory on oil."



## Fordson Tractor Men Meet at Dearborn

State Distributors Discuss Plans and Fix Trade Policies for Coming Year

DETROIT, Nov. 30—The State and district distributors of the Fordson tractor have been summoned to Dearborn, Mich., for a conference on Dec. 5 and 6. This summons automatically called off the meeting of the distributors, which had been set for Chicago on Dec. 2, 3 and 4.

The purpose of the conference is to discuss plans for the coming year, to fix the trade policies which Henry Ford & Son desire to see put into effect in handling the Fordson business during 1919, and to discuss such other matters as may affect the distributors as a body. Among other important matters which will come up for discussion is the discount which shall be given the Fordson dealer. On a percentage basis this now is just a little more than 11 per cent, a rate of commission which many of the dealers contend is too low when the cost of necessary service is taken into consideration. Some of the distributors will strive to have the commission raised so that it shall be at least on a parity with that given on Ford cars.

The summons to come to Dearborn for a conference on practically the same date the distributors' association had set for the Chicago meeting lends strength to the belief that Henry Ford is not entirely in accord with the purposes of the association. There are men in the association who chafe under dictation and who are disposed to assert a degree of independence of action which it is said does not altogether please Mr. Ford. It is intimated that at the Dearborn meeting the rights of the distributors to conduct their business in their own way and free from dictation from Dearborn may be threshed out.

### Roadway Legislation Planned

WASHINGTON, Nov. 29—Indications point to the presentation of a number of bills before Congress for the establishment of highways throughout the country, and it is expected that this will be one of the important subjects at the next session. The immense value of the motor truck for rural express, postal service and as an auxiliary to railroads, the importance of highways for the development of food production, and the general increased value through education and transportation accomplished by highways have been recognized by practically all the Government officials here in statements made at various times.

Secretary Houston of the Department of Agriculture stated this week that reconstruction plans must include highway construction under the federal aid road act. The public highways, he said, will be a vital factor, and construction should be started as soon as possible. Road

building he considers a worthy project for employment of the surplus labor supply expected to result from demobilization of the Army.

Under the federal aid road act federal and state funds appropriated for road building and not expended because of the stoppage of construction by the war will amount this year to about \$75,000,000.

### Tractor Ousts Horse in Canada

TORONTO, ONT., Nov. 29—A census of the livestock of Ontario, figures of which are reported by the Grand Trunk Railway system, shows a decrease in the number of horses for 1918 over 1914 of from 774,000 to 733,000, due, says the report, to the influence of the tractor on farming. Tractor farming with government assistance has attained a great vogue in the province, and the uncertainty of the future demand for horses on account of growing use of the tractor has had a corresponding effect on the number of horses.

There has also been a noticeable decrease in the number of fowl, due to the fact that the care of fowls is mainly in the hands of women and children, who have been too busily engaged in the fields since 1915 to take care of poultry. The following table shows the number of heads of animals of various kinds and of poultry on Ontario farms in 1914 and 1918:

Live stock	1914	1918
Horses	774,000	733,000
Milch cows	1,006,000	1,102,000
Total cattle	2,604,000	2,812,000
Sheep	922,000	972,000
Hogs	1,770,000	1,656,000
Poultry	14,175,000	12,271,000

### Baruch Resigns from War Industries Board

WASHINGTON, Dec. 2—Bernard M. Baruch has tendered his resignation as chairman of the War Industries Board, taking effect Jan. 1, and substantiating thereby the forecasts that all restrictions upon the peace time industries will be removed with the beginning of the new year. The activities of the War Industries Board have already been curtailed as rapidly as its releases with industries would permit. Further, all restrictions which were placed and were regarded necessary to complete the war program have been either removed or largely modified. The automobile industry is still held to a 75 per cent production basis, and motor truck makers must abide by the allotments for manufacture provided prior to Nov. 11 by the Automotive Section, War Industries Board, but both of these restrictions, it may safely be assumed, will be lifted by the end of this year.

### Discover Fuel for Internal-Combustion Engine

WASHINGTON, Dec. 2—It is reported here that both the United States Navy Department and the National Advisory Committee for Aeronautics have discovered a fuel for internal combustion engines which is said to be superior to the new Liberty fuel, discovery of which was just announced.

## To Localize Contract Cancellations

Adjustments to Be Made by District Boards—Two Appeals Are Possible

WASHINGTON, Nov. 30—A complete plan has been devised by the War Department for adjustment of war contracts, according to an announcement by Benedict Crowell, Assistant Secretary of War. After the War Department decides which contracts will be carried through or gradually tapered, and contractors are notified accordingly, the plan provides that the holder of a canceled war contract will make an inventory of the raw material on hand, work in process and finished articles ready for delivery, and any other items of cost with figures on the various elements of cost which enter into production, such as new buildings and machinery. This inventory will be checked by War Department accountants. The statements will then be presented to the district boards in the specific locality. District boards have been organized in all of the large cities that are centers of production.

A board to deal with ordnance contracts at each of these places will be presided over by the district ordnance chief, in every case a civilian and prominent business man in the community, and if possible a man connected with the prevailing industry of the locality. Another member of the board will be the regional advisor of the War Industries Board, and a third a man of legal training, the fourth a cost accountant, and fifth a highly experienced production expert. These boards, it is expected, will make just and prompt settlements on all claims.

Boards will also be established for the settlement of contracts for more standard articles of merchandise. These boards will operate along similar lines, and wherever a settlement can be reached between the contractor and board, recommendations arrived at will be forwarded to Washington to be finally approved and promptly paid in full.

Wherever there is a difference of opinion between the board and the contractor a statement can be made to the Claim Boards in this line of work in Washington which will consider the data presented and endeavor to reach a settlement with the contractor. Failing in this the matter will be taken up with the Board of Contract Adjustment of the War Department, which assists the Secretary of War and is the final tribunal in such cases.

If the contractor is still dissatisfied with the decisions he can appeal to the Court of Claims.

"The War Department," stated Mr. Crowell, "recognizes that it is highly important to make provisions for cases where contractors have such a considerable part of their working capital tied up in expenditures for labor and other disbursements on unfinished work that without a speedy repayment to the

contractors of at least a part of this sum they cannot make that prompt return of the plants to commercial work essential to prevent a break in their continuous operation and employment of labor.

"In many such cases, while it is practicable to determine readily a minimum sum which will be within the figure of ultimate settlement, it will frequently be difficult to fix with exactness the ultimate sum without a delay which will lose to the Government and the country the advantage of speedy return of such plants to commercial work.

"Where this situation exists and to meet it, it will be the policy of the Department to stand ready to enter into supplementary contract with such contractors by which a sum not to exceed 75 per cent of the amount which it is certain will ultimately be paid by the Government on the agreed basis of adjustment will be paid immediately to the contractor upon his consent to a termination of the original contract and a release to the Government of its obligations thereunder, the Department agreeing to pay subsequently such additional sum as it may determine will complete payment to the contractor on the agreed basis of adjustment.

"The machinery outlined above will be availed of in arriving at the terms of final settlement.

"This plan will make it practicable for contractors to secure almost immediately a very substantial part of their working capital for use in switching back to commercial work, even where the circumstances are such that the final determination of the compensation to be paid cannot be so speedily arrived at."

#### Attorney General Examining Contract Legality

WASHINGTON, Dec. 2—Attorney General Gregory will file an opinion shortly with regard to the legality of contracts which have not been legally executed—for example, those given and accepted verbally or by telegram. Congress may be asked to straighten out the tangle by adopting legislation to legalize such contracts. This problem was created by the stand taken by Controller Warwick of the Treasury, who maintains that where contracts were made by telegraph or telephone and not formally signed no contracts exist because they were not legally executed.

#### Fifth Avenue Bus Earnings

NEW YORK, Dec. 3—In its annual report, the Fifth Avenue Coach Co. shows total revenue of \$2,654,457 for the year ending July 30, 1918. This is an increase of \$410,640 over the preceding year. Net income amounts to \$399,147 after deduction of expenses and taxes, and the surplus for the year is \$191,794.

#### Willys-Overland Declares Quarterly Dividend

NEW YORK, Dec. 3—The Willys-Overland Co., Toledo, Ohio, has declared a regular quarterly dividend of 1% per cent on its preferred stock. The dividend is payable Jan. 1, 1919, to stock of record Dec. 20.

## Record Earnings for U. S. Rubber

Shows \$21.64 Per Share for First Six Months of 1918—Assets Triple Liabilities

NEW YORK CITY, Nov. 30—The United States Rubber Co. established record earnings during the 6 months ended June 30, 1918, when it earned \$21.64 a share on outstanding common stock amounting to \$36,000,000. The extraordinary record which has been made is indicated by the fact that during the entire year of 1917 the company earned only at the rate of \$28.77 per share.

At the present time current assets exceed current liabilities by three and one-half to one, despite the fact that the company has charged off nearly half a million dollars more for war taxes during the first 6 months of the year than it did for the full year of 1917.

The following is the consolidated balance sheet of the company and its subsidiary:

	June 30, '18	Dec. 31, '17	Dec. 31, '16
<b>ASSETS</b>			
Plants, etc.	\$132,322,696	\$128,105,826	\$130,187,629
Inventory	76,760,203	72,440,170	48,530,398
Cash	11,116,050	9,463,833	10,123,709
Notes rec.	1,422,530	2,056,906	1,764,000
Accts. rec.	41,692,422	36,313,607	26,052,707
Securities	10,537,140	7,937,921	3,481,655
Sinking fd.			
cash			509,852
D'd assets	2,292,041	1,257,518	1,716,620
<b>Total</b>	<b>\$276,143,082</b>	<b>\$257,575,781</b>	<b>\$222,366,569</b>
<b>LIABILITIES</b>			
1st pfd. stk.	\$61,722,200	\$61,722,200	\$60,773,600
2d pfd. stk.	403,600	403,600	403,600
Com. stk.	36,000,000	36,000,000	36,000,000
Sub. co. stk.	320,655	320,655	1,376,980
Bonds	71,600,000	71,600,000	36,807,000
Accts. pay.	7,892,257	8,548,084	6,526,168
Gen. res.	10,746,409		
Dfts. pay.		1,877,676	1,891,093
Accrued tax, etc.	5,815,597	5,249,718	801,527
Accept cr. rub. imp.	2,191,720		
Notes and			
Ins. pay.	21,249,995	19,430,955	26,703,866
Misc. res.	1,865,867	4,874,021	1,300,329
Dep. res.*	8,741,753	7,707,891	5,000,000
Div. res.	1,240,498	1,240,498	1,223,040
Sub. co.			
surd.	6,709,275	6,709,275	15,080,231
Surplus	39,643,256	31,891,207	28,479,135
<b>Total</b>	<b>\$276,143,082</b>	<b>\$257,575,781</b>	<b>\$222,366,569</b>

\*These reserves have been set up to provide against shrinkage in inventories that may arise from post-war conditions, and possible increase in taxes if basis of taxation should be changed by a new revenue law—provision for taxes having only been otherwise made on same basis as called for by existing tax laws.

#### Export Conservation to Be Shortened

WASHINGTON, Nov. 29—There will be a reduction in the items listed on the export conservation list shortly, according to announcement by the War Trade Board. Whether automotive products will be included in those items removed from the list and thereby allowed free export or not has not yet been decided by the board, which will make a definite announcement in the very near future.

Further modifications of rubber import restrictions announced to-day allow the

importation from overseas of not to exceed 900 tons of utta-siak in addition to the 740 tons heretofore approved.

Under a new export ruling steel can be shipped abroad to any destination without application for priority certificates from the War Industries Board.

Importers are requested in a new ruling to certify on their invoices where the goods were manufactured, or where they were purchased or contracted to be purchased for export to the United States, or where they were assembled for shipment to the United States.

#### Buyer from South Africa Here

NEW YORK, Dec. 3—L. H. Shapiro, representing S. Smith & Sons, Ltd., and H. W. Allkin & Co., Ltd., of Port Elizabeth, South Africa, is making a tour of the U. S. for the purpose of getting in touch with manufacturers of automotive products. He is especially anxious to hear from makers of accessories and parts for Ford and other cars, and can be communicated with at the National Bank of South Africa, 10 Wall Street, New York.

#### Studebaker Note Issue Coming

NEW YORK, Dec. 2—The Studebaker Corp. is considering additional financing which, according to President A. R. Erskine, probably will take the form of a new issue of notes. The purpose is to pay off a considerable amount of floating indebtedness and provide funds for other essential purposes. It is stated that there will be no new issue of preferred stock.

#### Chandler in Strong Position

CLEVELAND, Nov. 29—It is reported that the passenger car production of the Chandler Motor Car Co. for the present year is between 9000 and 10,000 as compared with a production of 15,000 cars in 1917. In addition about 1000 tractors have been built for government. Earnings are expected to be in excess of \$1,400,000 after deduction for taxes.

#### Prices Fixed on Hides Expire

WASHINGTON, Nov. 30—The maximum prices fixed by the War Industries Board on foreign hides and skins to cover shipments or take off during November and December, 1918, will expire automatically by limitation and will not be continued. Any foreign hides or skins sold on or after Jan. 1, 1919, ordered in this country, foreign countries or in transit, will not be governed by maximum prices.

#### Foreign Agency Desired

WASHINGTON, Nov. 29—The Bureau of Foreign and Domestic Commerce, Department of Commerce, has an inquiry from Switzerland desiring an agency for the sale of automobiles and agricultural implements. Further information can be secured by applying to the bureau and mentioning "Opportunity No. 27724."



WASHINGTON, Nov. 30—Detailed figures supplied by the Bureau of Foreign and Domestic Commerce show that for the year ending June 30 the total number of automobiles and motor trucks exported, not including cars and trucks shipped abroad for use of the American Expeditionary Forces, was less than in the fiscal years ending June 30, 1916 and 1917, but materially greater than in 1915 or any preceding year.

The record for the last six years is as follows:

Fiscal Year	Passenger Cars		Commercial Cars	
	No.	Value	No.	Value
1913.....	24,293	\$24,275,793	993	\$ 1,737,141
1914.....	28,306	25,392,963	784	1,181,611
1915.....	23,880	21,113,953	13,996	39,140,682
1916.....	56,234	40,660,263	21,269	56,805,548
1917.....	64,808	48,612,632	15,977	42,343,502
1918.....	52,312	45,331,366	12,200	31,874,459

# EXPORTS OF CARS AND TRUCKS FROM THE UNITED STATES FOR THE FISCAL YEAR ENDED JUNE 30, 1918.

Countries	Passenger Cars		Commercial Cars	
	Number	Value	Number	Value
Denmark.....	2	\$ 4,100	2	\$ 3,800
France.....	1,169	1,518,858	2,754	10,001,636
Gibraltar.....	.....	.....	27	58,325
Greece.....	4	6,580	14	32,000
Iceland and Faroe Is.....	15	11,396	1	2,245
Italy.....	129	78,228	52	28,055
Norway.....	97	115,810	40	133,227
Portugal.....	223	270,987	12	36,914
Russia in Europe.....	492	1,136,400	406	1,562,303
Spain.....	1,205	1,346,826	46	97,910
Sweden.....	95	111,377	7	10,360
Switzerland.....	3	1,533	.....	.....
England.....	742	1,712,672	4,805	13,438,981
Scotland.....	150	217,000	447	1,203,328
British Honduras.....	8	6,858	2	3,700
Canada.....	12,985	10,189,865	1,108	1,381,542
Costa Rica.....	199	85,070	5	10,245
Guatemala.....	34	46,657	3	5,512
Honduras.....	16	12,292	6	3,373
Nicaragua.....	49	32,031	1	2,509
Panama.....	129	93,329	47	47,859
Salvador.....	54	68,297	4	14,811
Mexico.....	2,578	1,653,545	365	525,664
Newfoundland and Labrador.....	27	34,676	2	7,250
Barbados.....	58	33,198	2	3,400
Jamaica.....	236	149,673	10	6,775
Trinidad and Tobago.....	161	100,571	14	.....
Other British West Indies.....	80	50,009	28	89,914
Cuba.....	2,846	3,029,813	554	1,130,982
Danish West Indies.....	152	12,313	2	2,845
Dutch West Indies.....	12	7,435	.....	.....
French West Indies.....	248	146,698	26	49,626
Haiti.....	102	54,613	11	10,578
Dominican Republic.....	248	157,607	21	13,323
Argentina.....	3,525	2,666,898	51	50,124
Bolivia.....	152	105,408	14	24,958
Brazil.....	1,575	1,000,011	24	31,133
Chile.....	3,399	3,576,511	220	282,638
Colombia.....	164	121,422	3	7,100
Ecuador.....	142	130,086	3	6,876
British Guiana.....	180	100,546	7	5,100
Dutch Guiana.....	16	17,775	.....	.....
French Guiana.....	13	3,632	.....	.....
Paraguay.....	13	5,025	.....	.....
Peru.....	784	913,669	73	155,834
Uruguay.....	2,232	1,177,463	16	15,809
Venezuela.....	160	97,485	16	12,410
Aden.....	8	6,879	.....	.....
China.....	833	818,659	23	26,236
British China.....	6	3,000	.....	.....
French China.....	2	2,017	.....	.....
Japanese China.....	10	7,321	.....	.....
Chosen.....	2	1,300	2	1,629
British India.....	73	53,428	11	20,275
Straits Settlements.....	287	202,221	70	113,554
Other British East India.....	11	17,740	3	7,138
Dutch East Indies.....	1,272	1,302,800	68	162,749
French East Indies.....	18	21,175	2	3,500
Hongkong.....	117	91,228	8	5,371
Japan.....	2,139	2,040,897	279	317,787
Persia.....	2	1,048	4	2,712
Russia in Asia.....	5	8,425	.....	.....
Siam.....	65	60,220	6	4,535
Australia.....	4,307	3,410,557	109	163,405
New Zealand.....	1,818	1,453,311	74	145,764
Other British Oceania.....	30	20,863	2	2,404
French Oceania.....	12	7,612	5	6,480
German Oceania.....	12	11,029	4	5,518
Philippine Islands.....	1,714	1,373,204	163	215,106
British West Africa.....	202	115,772	27	20,136
British South Africa.....	2,142	1,706,136	70	107,085
British East Africa.....	112	75,778	1	787
Canary Islands.....	15	5,378	.....	.....
French Africa.....	121	50,550	18	12,963
Liberia.....	12	4,220	.....	.....
Madagascar.....	2	1,659	.....	.....
Morocco.....	35	17,718	.....	.....
Portuguese Africa.....	9	9,673	.....	.....
Egypt.....	21	17,300	.....	.....
	52,312	\$45,331,366	12,200	\$31,874,459

## Six Years' Exports of Cars and Trucks

Shipments Aggregated 52,312  
Passenger Cars and 12,200  
Trucks, Valued at \$77,-  
205,825

The total valuation of passenger and commercial car exports during the last fiscal year, despite war conditions, was \$77,205,825, compared with \$90,956,134 in the 12 months ended June 30, 1917; \$97,465,811 in 1916; \$60,254,635 in 1915, and \$26,574,574 in 1914, the last pre-war year.

In addition, there were shipped to our non-contiguous territories: Alaska, 96 automobiles, valued at \$86,771; Hawaii, 1554, value \$1,507,498, and Porto Rico, 1106, value \$1,146,533 (class of cars not stated).

## Fuel Restriction May Soon Be Abolished

WASHINGTON, Nov. 30—The likelihood of modification of the fuel restrictions upon the automobile industry by the Fuel Administration is forecast by action taken by the Administration to-day in releasing several other industries from their curtailment programs. The florist, glassware and cement industries have been allowed to secure 100 per cent coal.

Plans now are for the abolition of the Fuel Administration by Jan. 1, 1919. Arrangements are being made with the Bureau of Mines and the Department of Interior generally to take over the various Fuel Administration departments. The Bureau of Mines will probably take over the oil and coal divisions, the Geological Survey and the Statistical Department.

## Canadian Tractor Men Support Duty on Imports

NEW YORK, Dec. 2—Canadian manufacturers of farm implements and tractors have entered the lists with the Consolidated Grain Growers over the importation of American tractors into Canada duty free. They claim that this practice is having a deleterious effect on Canadian industry and should be stopped. The Grain Growers, on the other hand, insist that the Canadian industry is not adequate to care for the tractor demand of the Dominion and that cheap tractors should be permitted to enter without duty.

Early in 1918 the Canadian Government eliminated the duty on farm tractors costing less than \$1,400. This was done as a war measure and to encourage food production. Larger tractors have never been found suitable for use in Canada.

In consequence of the elimination of the duty four times the number \$3,259,670 were imported into Canada. in 1917 as in the previous year. During 1917, 2792 American tractors valued at \$3,259,670 were imported into Canada. During the period between Feb. 7 and Oct. 31, 1918, a total of 8684 tractors valued at \$7,993,916 was imported.

The normal import duty on farm tractors is 20 per cent plus a special war tax of 7½ per cent. Farm implement manufacturers would like to see this tax applied as before the special exception was made. They contend that this duty is necessary to protect Canadian industry.

**Hovey Made Eclipse Vice-President**

BELOIT, WIS., Nov. 29—W. S. Hovey, for 5 years general manager of the Eclipse works of the Fairbanks-Morse Mfg. Co. at Beloit, Wis., has been elected vice-president in charge of all manufacturing of the organization. Mr. Hovey has moved his headquarters from Beloit to the general offices in Chicago, from which he will direct the plants at Beloit, Baltimore, Three Rivers, Mich., and Indianapolis.

**Major Segrave Returns to England**

WASHINGTON, Nov. 27—The British Aviation Mission has closed its offices preparatory to returning to England, and included with those who are relinquishing their duties in this country is Major H. O. D. Segrave, who has been the direct point of contact between the British Aviation Mission forces and the American Division of Military Aeronautics. In addition, Major Segrave has performed the important work of enlightening the American public through the press of the accomplishments of the British Air Forces. Prior to coming to this country Major Segrave served both with the active forces in France in the infantry and as a flier, and with executive divisions in England. The knowledge which the American public has of British air activities is due more to the information given out by Major Segrave than to any other agencies.

**Racine Rubber Secretary Dies**

RACINE, WIS., Nov. 30—Herbert C. Severance, secretary and general sales manager of the Racine Rubber Co. and a director of the Ajax Rubber Co., died recently at his home here. He was appointed general sales manager of the Racine Rubber Co. Nov. 1, 1913, and later elected secretary.

J. W. Powelson has been appointed works manager of the Pittsburgh plant of the Pittsburgh Model Engine Co. He was for a number of years production engineer of the Rochester Motors Co., Rochester.

**Chandler Declares Quarterly Dividend**

CLEVELAND, Dec. 2—The Chandler Motor Car Co. has declared a regular quarterly dividend of \$3 per share, payable Jan. 2, 1919, to stock of record Dec. 17.

**Ordnance Board of Claims Personnel Announced**

DETROIT, Dec. 4—The personnel of the Ordnance Board of Claims was announced yesterday as follows:

F. J. Robinson, chief of Ordnance District, chairman; C. E. Huyette, assistant chief; Major P. C. Thomas; Major C. W. Owston; C. C. Jenks, president of the Security Trust Co.; Captain J. G. Dalglish, secretary, and Captain C. A. Strand, chief of the investigating staff.

## Men of the Industry

*Changes in Personnel and  
Position*

**Willys-Overland Promotes Officials**

TOLEDO, Dec. 2—Edward H. Belden has been elected vice-president in charge of engineering, and Kelly R. Jacoby vice-president in charge of purchase of the Willys-Overland Co.

Richard A. Watson, secretary and production manager of the American Bronze Corp., Berwyn, Pa., has resigned his active duties with the company, but will continue as a member of the board of directors. He has resigned in order to carry on experimental work in connection with several patents in which he is interested. No successor has been appointed as yet.

**Lt. Col. Barrett Andrews Returns to Civil Life**

WASHINGTON, Dec. 2—Lt. Col. Barrett Andrews, head of the Training Section, Motor Transport Corps has received his discharge from the Army and will return to his civilian pursuits.

**Lt. Col. Uhler Resigns from M. T. Corps**

WASHINGTON, Dec. 2—Lt. Col. W. D. Uhler, head of the Convoy Service of the Motor Transport Corps has resigned and returned to his duties as Highways Commissioner of Pennsylvania.

**Frank Turner Is Buick Comptroller**

DETROIT, Dec. 4—President Walter P. Chrysler, of the Buick Motor Co., Flint, announces the appointment of Frank Turner, of Wilmington, Del., formerly comptroller of the DuPont company, as comptroller of the Buick company, to succeed L. M. Ohland. Mr. Ohland will later assume an important executive position with the General Motors Corp. in New York. E. W. Procter, also of the DuPont company, will succeed J. M. Ryan as assistant treasurer of the Buick company, Ryan having resigned. Both these appointments are effective Dec. 1.

**Wadhams Oil Co. Gives Insurance**

MILWAUKEE, WIS., Dec. 2—The Wadhams Oil Co., 359 Clinton Street, Milwaukee, one of the largest independent refiners and distributors of petroleum products in the Northwest, has presented each of its 150 direct employees with a free life insurance policy under the group insurance plan. The policies are fully paid by the company and range from \$500 to \$2,000, according to the term of service of the insured employee.

**Brickbauer Heads Plymouth Motor**

PLYMOUTH, WIS., Nov. 29—The Plymouth Motor Mfg. Co., formerly the Steiner Mfg. Co., Plymouth, Wis., at its annual meeting elected the following officers: President, George W. Brickbauer; vice-president, Charles Steiner; secretary, Frank Schryer; treasurer, Gust. W. Schiereck; directors, George Gerhard, H. J. Goelzer and C. C. Arndt. The company manufactures gasoline and kerosene engines and motors, and orders now on the books indicate that the coming year will be one of the busiest in its existence.

**McConnel to Represent M. A. M. A.**

WASHINGTON, Nov. 29—R. M. McConnel, formerly connected with the Firestone Tire & Rubber Co. at the Detroit branch, has arrived here to represent the Motor and Accessories Manufacturers Association. Mr. McConnel will be the point of contact for the manufacturers in the association with the Government.

B. T. McDonald, Jr., has been appointed superintendent of the Moline Plow & Tractor Co., to succeed J. L. Irving, who becomes vice-president and general trade manager. Mr. McDonald was formerly with the Poughkeepsie and Stoughton branches and also founded the McDonald Pitless Scale Co., which was absorbed by the Moline company 8 years ago.

S. E. Cole has been appointed manager of the Omaha branch of the H. W. Johns-Manville Co. He succeeds Chas. F. Simms, deceased.

L. E. Schumacher, who for the past eight years has been chief inspector of the Westinghouse Electric & Manufacturing Co. at East Pittsburgh, Pa., has been promoted to works manager of the Krantz Manufacturing Co. of Brooklyn, N. Y., the latest subsidiary of the former company.

James A. Bennett has been appointed purchasing agent of the Connecticut Telephone & Electric Co. of Meriden, Conn. This appointment is in the nature of a promotion for Mr. Bennett, who for some time past has been connected with the sales department of this company.

**Puritan Gets American Ball**

DETROIT, MICH., Nov. 30—The Puritan Machine Co. has purchased from the American Ball Bearing Co., Cleveland, its entire service and repair parts business, including a complete stock of parts, tools, jigs, dies, blueprints, etc., covering all American axles manufactured prior to Jan. 1, 1918. The stock is being moved to the Detroit plant of the Puritan company.



**Gerlinger Electric Steel Starts**

MILWAUKEE, WIS., Nov. 29—The Gerlinger Steel Castings Co., Milwaukee, which expects to place in operation a large new electric steel foundry on Dec. 10 or 14, has formed a new corporation to control the new plant. This is known as the Gerlinger Electric Steel Foundry Co., and is capitalized at \$99,000. At the same time the original company has increased its capital stock from \$25,000 to \$75,000. The ownership of both corporations is virtually identical, the principal officers being George P., William E., Walter and Charles A. Gerlinger, all of them pioneer foundry operators of the Milwaukee district and among the first to employ the electric furnace process of manufacturing castings. The concern is widely known in the motor car, truck and tractor manufacturing industry.

**Pull-More Plant on Block**

NEW CASTLE, PA., Nov. 30—The plant and equipment of the Pull-More Motor Truck Co. is to be sold by the receiver on Friday, Dec. 27, at 2 p. m. Included is a brick building 100 by 500 and 20 acres of ground.

**International Steel Nearly Ready**

HARTFORD, WIS., Nov. 29—The International Steel Products Co., formerly of Milwaukee, hopes to be able to begin operations in its new \$40,000 works at Hartford, Wis., on Dec. 2. The company will specialize in the manufacture of mufflers or silencers for motor vehicles and gas engines and its initial capacity will be 1000 mufflers a day.

**Not to Take Ford Milwaukee Plant**

MILWAUKEE, Nov. 29—Official announcement that the Government had abandoned the project of converting the Milwaukee assembling plant of the Ford Motor Co. into a reconstruction hospital was received in Milwaukee on Saturday, Nov. 23, by owners of apartment buildings near the plant, which has been commandeered to serve as officers' barracks, nurses' homes and for similar purposes.

**Two New Allis-Chalmers Tractors**

MILWAUKEE, WIS., Nov. 29—The Allis-Chalmers Mfg. Co., Milwaukee, which for several years has manufactured farm tractors in a single standard model, known as a 10-18, has increased the line to embrace two new models. One is a 6-12, listing at \$790, and the other a four-wheeled type, rated 15-30.

**Standard Foundry Co. Erects Plant**

RACINE, WIS., Nov. 30—The Standard Foundry Co., Racine, Wis., a large gray iron casting plant, has awarded contracts for the erection of a \$50,000 foundry building, 80 x 200 ft. in size, and of brick and steel construction. It is to be ready to begin operations shortly after Feb. 1. Arthur G. Janes is president and general manager.

## Current News of Factories

*Notes of New Plants—Old  
Ones Enlarged***Universal Motor Increases Capital**

OSHKOSH, WIS., Dec. 2—The Universal Motor Co., Oshkosh, Wis., manufacturer of direct-connected generating systems for isolated power and illumination requirements, has increased its capital stock from \$50,000 to \$100,000. The company has been filling large Government orders for mobile repair shop power units.

**Board of Review Contracts**

WASHINGTON, Nov. 30—The following contracts were placed by the Board of Review prior to the signing of the armistice and have just been announced:

Mandee Mfg. Co., Springfield, car hubs, \$8,800.  
McCord Mfg. Co., Detroit, radiators, \$7,020.  
McCord Mfg. Co., Detroit, radiators, \$7,687.50.  
Ford Motor Co., Detroit, Ford cars, \$235,887.50.  
Locomobile Co. of America, Bridgeport, chassis, \$2,232,230.  
Covert Gear Co., Lockport, clutches; seven clutches additional at \$0.8087 shall be delivered.  
United States Tire Co., New York, casings and tubes f.o.b. delivery point to be Detroit instead of New York.  
Dodge Bros., Detroit, Dodge cars; contractor may deliver Elsemann magneto G-4, \$18.50 or Simms magneto at \$12.50 when available.  
Cadillac Motor Car Co., Detroit, automobiles; change in specifications and price from \$3,309 to \$3,360; also \$7 for Klaxon horn and 50 cents switch key additional.

**Quartermaster Contracts**

WASHINGTON, Nov. 30—The following orders were placed by the Quartermaster Department on Nov. 1, prior to the armistice, and just announced:

Ford Motor Co., Detroit, motor parts, \$5,140.67.  
Chandler Radiator Co., Detroit, radiators, \$12,600.  
Pierce Oil Corp., New York, oil, \$1,478.40.  
Atlantic Refining Co., Philadelphia, gasoline, \$11,550.  
Indian Refining Co., New York, motor oil, \$572.90.  
Gulf Refining Co., Pittsburgh, gasoline, \$4,926.  
Gulf Refining Co., Pittsburgh, fuel oil, \$3,816.  
Atlantic Refining Co., Philadelphia, gasoline, \$5,577.

**Ordnance Contracts**

WASHINGTON, Nov. 30—The following contracts were placed by the Ordnance Department prior to the signing of the armistice and have just been announced:

Bijur Motor Appliance Co., Generator-starters, etc., \$120,466.  
Langstadt-Meyer Construction & Supply Co., gasoline, engine driven generator sets, \$40,590.  
Chatham Machine & Tool Works, tools and accessories for mobile repair shop, \$20,473.35.  
Hale & Kilburn Corp., dismantling, camouflaging art. rep. trucks, \$15,000.  
Dorris Motor Car Co., air pressure pumps for petrol tanks, \$57,000.  
Holt Mfg. Co., ex-work on caterpillar gun mounts, \$15,000.

**Prest-O-Lite Refill Station Damaged**

MILWAUKEE, Nov. 29—The Milwaukee filling or compressing plant of the Prest-O-Lite Co., Indianapolis, was almost totally wrecked by an explosion last week. One workman was killed and another fatally injured. The plant is located at Thirty-third Avenue and Mitchell Street, in West Milwaukee. The cause of the explosion is not yet known, but suspicion has been aroused by the finding of a loaded bomb in the vicinity. It is expected that the plant will be rebuilt at once.

**Cars Coming from Madison**

MADISON, WIS., Nov. 29—The Universal Products Co. of Madison, Wis., has been organized, with a capital stock of \$50,000, to engage in the manufacture and sale of motor cars, trucks, tractors, machinery and other equipment, and the installation of lighting and heating plants. The incorporators are John L. Newman, John L. Bourke and Ethel Lee, all of Madison.

**No Curtiss Plants to Close**

BUFFALO, Nov. 29—The Curtiss Aeroplane & Motor Corp. does not intend to close any of its plants, despite the cancellation of Government contracts. It was stated by an official of the company that the shops will be kept busy on aircraft for other than war use. The experimental field at Garden City, L. I., will be maintained.

**Syracuse Home for Lippard-Stewart**

BUFFALO, Nov. 29—The Lippard-Stewart Motor Car Co. has been completely reorganized with additional capital. The entire stock and equipment of the company is being moved from Buffalo to Syracuse, where the business will be carried on henceforth. Plans and specifications of new models will be made public shortly.

**More Room for Canadian Allis-Chalmers**

TORONTO, Nov. 29—The Canadian Allis-Chalmers Co. has had plans prepared for an addition to its gray iron foundry, to cost \$20,000. Work on the proposed addition will be started as soon as possible. Part of this plant will be used for tractor production.

**Ralston Iron Adds Trucks**

SAN FRANCISCO, Dec. 2—The Ralston Iron Works, which for the past 4 years has been manufacturing the Ralston truck unit, has added trailers and semi-trailers to its line as well as pole and lumber dollies and special trailer equipment. The company has taken over the Hewitt-Ludlow motor truck plant, now under construction, and is planning to increase the production of Hewitt-Ludlow 1½ to 5-ton trucks. Pratt & Williams, which has heretofore distributed Ralston products, hereafter will be exclusive distributor.

## AUTOMOTIVE MATERIALS MARKETS

## Materials Market Prices

## Acids:

Muriatic, lb. ....	.02	-.03
Phosphoric (85%)..	.35	-.39
Sulphuric (60), lb..	.006	

## Aluminum:

Ingot, lb. ....	.33	
Sheets (18 gage or more), lb. ....	.42	

## Antimony, lb. .... 13 3/4 - 13 3/8

## Burlap:

8 oz., yd. ....	.17 1/4 - .17 1/2	
10 1/2 oz., yd. ....	.21 1/2 - .22	

## Copper:

Elec., lb. ....	.26	
Lake, lb. ....	.26	

## Fabric, Tire (17 1/2 oz.):

Sea Is., combed, lb.	1.65-1.70	
Egypt, combed, lb.	1.25-1.35	
Egypt, carded, lb.	1.20-1.30	

## Peelers, combed, lb. 1.05-1.20

## Peelers, carded, lb. .95-1.05

## Fibre (1/2 in. sheet

## base), lb. .... .50

## Graphite:

Ceylon, lb. ....	.09	-.22
Madagascar, lb. ....	.10	-.15
Mexico, lb. ....	.03 3/4	

## Lead, lb. .... .07 3/4 - .08 1/4

## Leather:

Hides, lb. ....	.18	-.35 1/4
Nickel, lb. ....	.40	

## Oil:

## Gasoline:

Auto., gal. ....	.24 1/2	
68 to 70 gal. ....	.30 1/2	

## Lard:

Prime City, gal. ....	2.30-2.35	
Ex. No. 1, gal. ....	1.62	

## Linseed, gal. .... 1.63-1.65

## Menhaden (Brown)

## gal. .... 1.42-1.43

## Petroleum (crude),

## Kansas, bbl. .... 2.25

## Pennsylvania, bbl. 4.00

## Rubber:

## Ceylon:

## First latex pale

## crepe, lb. .... .63

## Brown, crepe, thin,

## clear, lb. .... .60

## Smoked, ribbed

## sheets, lb. .... .61 1/2

## Para:

## Up River, fine, lb. .68

## Up River, coarse,

## lb. .... .40

## Island, fine, lb. .... .59

## Shellac (orange), lb. .... 70-72

## Spelter .... .08 1/2 - .08 3/4

## Steel:

## Angle beams and

## channels, lb. .... .63

## Automobile sheet

## (see sp. table).

## Cold rolled, lb. .... .06 1/2

## Hot rolled, lb. .... .03 1/2

## Tin .... .71 - .72

## Tungsten, lb. .... 2.45-2.50

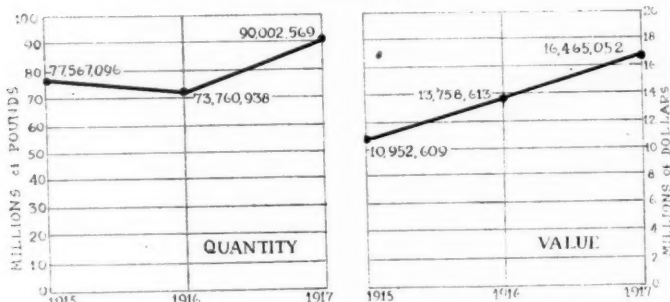
## Waste (cotton), lb. .... .12 3/4 - .17

## AUTOMOBILE SHEET PRICES

(Based on No. 22 Gage. Other gages at usual differentials)

	Primes only per 100 lbs.	Primes when seconds up to 15 per cent are taken per 100 lbs.
Automobile body stock.....	\$5.95	\$5.85
Automobile body stock, deep stamping	6.20	6.10
Automobile body stock, extra deep stamping	6.45	6.35
Hood, flat, fender, door and apron, or splash guard stock	6.05	5.95
Crown fender, cowl and radiator casing, extra deep stamping	6.55	6.45
Crown fender, cowl and radiator casing, deep stamping	6.30	6.20
Automobile Sheet Extras for Extreme Widths:		
Nos. 17 and 18 over 36 in. to 44 in., 10c. per 100 lb.		
Nos. 19 and 21 over 36 in. to 44 in., 30c. per 100 lb.		
Nos. 22 to 24 over 26 in. to 40 in., 40c. per 100 lb.		
Nos. 22 to 24 over 40 in. to 44 in., 80c. per 100 lb.		
Black Sheet extras to Apply to Narrow Widths:		
Oiling, 10c. per 100 lb.		
Patent leveling, 25c. per 100 lb.		
Resquaring, 5 per cent of gage price after quality, finish and size extras have been added.		
Seconds 10 per cent less than the invoice Pittsburgh price for corresponding primes.		

## Sheet Zinc Produced in 1917



1917 figures show the effort that has been made in the rolling mills to produce sheet zinc sufficient to meet the demand caused by the necessity of lining packing cases for shipment overseas

## Automotive Securities Quotations on the Chicago Exchange at Close Nov. 30

	Bid	Asked		Bid	Asked		Bid	Asked
Auto Body Co.....	7	10	Mitchell Motor Co.....	30	35	Willys-Overland, com.....	23 3/4	24 3/4
Briscoe Motor Car, com.....	11	..	Motor Products Corp.....	38	..	Willys-Overland, pfd .....	87	89
Briscoe Motor Car, pfd.....	40	55	Nash Motors Co., com.....	150	175			
Chandler Motor Car.....	99 3/4	101 1/2	Nash Motors Co., pfd.....	85	95			
Chevrolet Motor Car.....	144	146	National Motor Co.....	9	12 1/2			
Cole Motor Car Co.....	90	105	Packard Motor Car, com.....	115	125			
Continental Motors, com.....	8 1/2	9	Packard Motor Car, pfd.....	92	95			
Continental Motors, pfd.....	92	96	Paige-Detroit Motor, com.....	26 1/2	27 1/2			
Edmunds & Jones, com.....	18	..	Paige-Detroit Motor, pfd.....	8 3/4	9 1/2			
Edmunds & Jones, pfd.....	75	90	Peerless Motor Truck.....	15	17			
Electric Storage Battery.....	50	60	Pierce-Arrow Mot. Car, com.....	41 1/4	42 1/4			
Federal Motor Truck.....	33	35	Pierce-Arrow Motor Car, pfd.....	102 1/2	103 1/2			
Fisher Body Co., com.....	36	40	Premier Motor Corp., com.....	4	..			
Fisher Body Co., pfd.....	92 1/2	93	Premier Motor Corp., pfd.....	..	75			
Ford Motor of Canada.....	215	225	Prudden Wheel Company.....	15	17 1/2			
General Motors, com.....	125 1/2	126 1/2	Reo Motor Car Co.....	21	22			
General Motors, pref.....	81 3/4	83 3/4	Republic Motor Truck, com.....	35	37			
Hupp Motor Car, com.....	4 1/2	5	Republic Motor Truck, pfd.....	88	92			
Hupp Motor Car, pfd.....	81	85	Saxon Motor Car, com.....	7 1/2	9 1/2			
Kelsey Wheel Co., com.....	28	33	Scripps-Booth Corp.....	21	25			
Kelsey Wheel Co., pfd.....	85	90	Stewart Warner Speed Corp.....	74	76			
Manhattan Electric S., com.....	..	48	Stromberg Carburetor Co.....	24	28			
Maxwell Motor, com.....	27	28	Studebaker Corp., com.....	49	50			
Maxwell Motor, 1st pfd.....	50 3/4	51 3/4	Studebaker Corp., pfd.....	92 1/4	100			
Maxwell Motor, 2nd pfd.....	19 1/4	20 1/4	Stutz Motor Car Co.....	44	46			
McCord Mfg., com.....	30	35	United Motors Corp.....	32	34			
McCord Mfg., pfd.....	90	95	White Motor Co.....	44 1/2	45 1/2			

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**German Piracy of American Trademarks**  
(Continued from page 967)

Congress, and to which considerable publicity has been given, appears now likely to be abandoned in favor of the adoption of the simple form of marking, consisting of the words "Made in U. S. A."

The national trademark proposition has been thrashed out from all angles by English commercial organizations and others over a period of years, and the final conclusion has been reached that a mark consisting of a device is likely to be detrimental rather than otherwise in the building up or reorganizing of foreign trade, and the probability is that nothing further will be done along these lines in England.

**Favor Country-of-Origin Mark**

It seems now to be generally admitted that the use of a national trademark in the form of a device must of necessity detract from the value of the trader's own mark, and it is believed that the best protection can be secured by endeavoring to obtain the enactment of laws in the United States and abroad which would make it an offense to sell goods manufactured in other countries without carrying thereon a clear indication as to the country of origin. Dumping of goods on the American market without indicating the country in which such goods are made would thus be avoided, and the American manufacturer who desires to see the United States obtain its full share of foreign trade would be encouraged to turn out the best make of goods and thus add prestige to the mark "Made in U. S. A."

**New Loening Plane  
Breaks Record****Travels 145 M.P.H. with Full  
Military Load, Including  
4 Guns**

WASHINGTON, Dec. 3.—Announcement of a new airplane—the Loening 2-seater monoplane—was made in Washington to-day, together with the information that the plane has developed 145 m.p.h. with a full military load, including 4 guns, which is in excess of any record made by a European single seater combat machine. The Loening plane in its tests also climbed to 25,000 ft. in remarkable time, which has not been made public, carrying 2 passengers and thereby establishing another new record.

The plane is American designed and American built. It is smaller than the DeHaviland-4 of course, and weighs only 2400 lb. loaded for the air, which is practically the weight of a single seater scout. It is driven by an 8-cylinder 300 hp. Hispano-Suiza. The whole power plant is a unit construction and can easily be removed from the body of the plane. There are several original ideas in the under strutting. The arrangement of the seats provides the pilot with 50 per cent more vision than any other combat machine produced prior to or during the war. The plane carries sufficient fuel for 3½ hr.

Grover Cleveland Loening, the designer and builder, is an American, an aero engineer with 8 years' experience, and the

author of several text books used in study by American flying cadets. He is connected with the Loening Aeronautical Corp., 45 West Eleventh Street, Long Island City, New York.

**Co-ordination of Legislative and  
Operative Functions in Labor**

(Continued from page 959)

operating leaders and their subordinates and tending to decrease the operating efficiency.

The attitude of the worker in looking to his occupational labor organization for his advantage in legislative industrial matters tends to destroy any organization incentive which he may have and carries him from place to place upon any fancied grievance, tends to increase his desire to protect his occupation as a class, to enforce his attempt to control the conditions of his work, and makes in other ways for continued strife and industrial inefficiency.

There is no hope in the destruction of labor organizations, even if that were possible, because the present system of organizing the industrial unit has failed to satisfy the requirements in such important particulars that the destruction of the present labor organizations would necessitate a demand for political relief.

As a matter of fact, however, labor organizations are getting stronger, and unless some means are taken to provide proper machinery for the control of the legislative functions of the industrial unit, the outlook is one of increased conflict and increased political interference with industrial operations.

# Calendar

**ENGINEERING****S. A. E. Meetings  
1919**

- Jan. 8—Minneapolis Section, S. A. E.—Hotel Radisson. "Governors for Tractors and Truck Engines."
- Jan. 12, 13, 14—New York. Winter Meeting, Society of Automotive Engineers, Engineering Societies Building.
- Feb. 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Radiator Cooling Fans."
- March 5—Minneapolis Section, S. A. E.—Hotel Radisson. "Tractor Service and Sales."
- April 2—Minneapolis Section, S. A. E.—Hotel Radisson. "Implement Designed for Tractor Belt Power and Their Characteristics."

**MOTOR SHOWS**

- January—Detroit, Mich. Detroit Automobile Dealers' Assn. H. H. Stuart, Manager.
- January or February—Milwaukee, Wis. Milwaukee Auto Trade Assn. Bart J. Rudle, Manager.
- Feb. 15-22—Louisville, Ky. Louisville Auto Dealers' Assn.

- Feb. 15-22—Newark, N. J. N. J. Auto Exhibition Co. Calude Holgate, Manager.
- Feb. 15-22—Minneapolis, Minn. Minneapolis Auto Trade Assn. Walter B. Wilmot, Manager.
- Feb. 17-22—Des Moines, Iowa. Tenth Annual, Des Moines Automobile Dealers' Assn. C. G. Van Vliet, Manager.
- Feb. 17-24—Passenger Cars; Feb. 24-27, Trucks—South Bethlehem, Pa. Lehigh Valley Auto Shows Co. J. L. Elliott, Manager.
- March 3-8—Buffalo, N. Y. Buffalo Automobile Dealers' Assn.
- March 1-10—San Francisco, Cal. Motor Car Dealers' Assn. G. A. Wahlgreen, Manager.
- March—Boston. Boston Automobile Dealers' Assn. Chester I. Campbell, Manager.
- Second or third week March—St. Louis, Mo. St. Louis Auto Mfrs. & Dealers' Assn. Robert E. Lee, Manager.
- March 22-29, Passenger Cars; April 1-5, Trucks—Brooklyn. Brooklyn Motor Vehicle Dealers' Assn. I. C. Kirkham, Manager.
- Third week March—Trenton, N. J. Trenton Auto Trade Assn. John L. Brock, Manager.

- Probably February—New York. Automobile Dealers' Assn. Charles A. Stewart, Manager.
- Probably March—Chicago. Chicago Automobile Trade Assn.
- March—Philadelphia. Philadelphia Automobile Auto Trade Assn. A. L. Maltby, Manager.
- March—Pittsburgh. Automobile Dealers' Assn. of Pittsburgh. John J. Bell, Manager.
- March—Syracuse, N. Y. Syracuse Automobile Dealers' Assn. Harry T. Gerdner, manager.
- March—Utica, N. Y. Utica Motor Dealers' Assn. W. W. Garabrant, Manager.
- Late March or early April—Cleveland, Ohio. Cleveland Auto Show Co. Fred H. Caley, Manager.
- April 5-12—Montreal, Can. Automobile and Used Car Exposition. T. C. Kirby, Manager.
- Not decided—Bridgeport, Conn. Auspices of City Battalion. B. B. Steiber, Manager.
- Not decided—Harrisburg, Pa. Harrisburg Motor Dealers' Assn. J. Clyde Myton, Manager.
- Not decided—Hartford, Conn. Hartford Automobile Dealers' Assn.

- Not decided—Indianapolis, Ind. Indianapolis Auto Trade Assn. John B. Orman, Manager.
- Not decided—Kansas City, Mo. Kansas City Motor Dealers' Assn. E. E. Peake, Manager.

**TRACTOR SHOWS**

- Feb. 10-15—Kansas City, Mo. Fourth Annual Tractor Show. Sweeney Building, Kansas City Tractor Club. Guy H. Hall, Sec.
- Feb. 18-22—Wichita, Kan. Annual Mid-west Tractor and Thresher Show. Wichita Tractor and Thresher Club. Forum.

**CONVENTIONS**

- Dec. 16, 17, 18—Chicago. Convention, National Association of Automobile Accessory Jobbers. (Directors and Committees, Dec. 16; General Sessions, Dec. 17-18.)
- Jan. 12-14—New York. Meeting, Society Automotive Engineers.
- Feb. 25-28—New York. Sixteenth Annual Convention, American Road Builders' Assn.

## Official History of Aircraft Production

(Continued from page 969)

from the United States Government as soon as they had finished their foreign contracts.

"It was clearly apparent that the speediest and most satisfactory method of handling the engine situation would be to develop a distinctive American engine which would adapt itself to American methods of manufacture. Numerous experimental engines had been made by various companies, none of which were adapted to war requirements.

"The Hall-Scott Co., at Berkley, Cal., had for several years been manufacturing aviation equipment for use by foreign governments, chiefly in the Orient, and E. J. Hall, of that company, had traveled in Europe at about the beginning of the war and had inspected the engines made both by the Allies and by the Germans.

### Packard Developments

"The Packard Motor Car Co. had for approximately 2 years been working on the development of an aviation engine of the 200 hp. class. This engine had not been flown in a plane but had been successfully used in racing cars. It was, however, too heavy for war purposes, but represented the farthest advance in this country toward the development of an aviation engine. J. G. Vincent, chief of the engineering forces of the Packard company, had, by reason of this development and of his study of the subject, acquired a large understanding of aviation engines.

"Mr. Deeds, therefore, called Vincent and Hall into conference in Washington in May, 1917, and on May 29 these two men started the design of an American aviation engine to develop approximately 200 hp. with 8 cylinders and 300 hp. with 12 cylinders.

### Organized Staff of Draftsmen

"They organized a large force of draftsmen, and as rapidly as they completed drawings they were hurried to the Packard Motor Car Co. in Detroit, and in its tool room corresponding parts were made.

"This work was expedited so rapidly that on July 4, 1917, a complete 8-cylinder engine was delivered in Washington. It was set up at the Bureau of Standards and ran successfully. The development of the engine was pushed rapidly, both at the Bureau of Standards and at the Packard Motor Car Co. in Detroit, and the developmental work on 8 and 12-cylinder engines was hurried forward by a large corps of expert engineers and mechanics.

"In August, 1917, the production of aviation equipment was constituted in the Equipment Division of the Signal Corps, and the Engine Production Department was created as a portion of that division. On that date the writer was put in charge

of the Engine Production Department and the real work of producing engines was begun. Engines required fell naturally into three classes:

"1. Elementary training.

"2. Advance training.

"3. Combat.

"As to the elementary training, there were available the following engines:

"Curtiss OX, of approximately 90 hp.

"A-7A, 4 cylinder engines of approximately 100 hp.

"Hall-Scott.

### Orders Consummated Rapidly

"Orders were consummated for the production of these engines as promptly as possible.

"For advanced training, there were available the Gnome 110 hp., the LeRhône 80 hp., and the Hispano-Suiza 150 hp. The General Vehicle Co. proceeded with the production of the 110 hp. Gnome.

"The Union Switch & Signal Co. had been persuaded to take the contract for the production of the 2500 LeRhône engines, 80 hp. type. Their contract has been continued and the Union Switch & Signal Co. has delivered up to this date approximately 1200 of these engines. We have had the assistance of Georges Guilhot, the engineer of the French Gnome and LeRhône factories, who pronounces the engines built for the Union Switch and Signal Co. to be the best rotary engine ever constructed.

"We arranged with the Wright-Martin Co. to increase their facilities for the production of the 150 hp. Hispano type, and their work had such good results that in May, 1918, that company delivered 530 of these engines.

"As to combat engines, it was clear that the only one available for our manufacturing purposes would be the Liberty, and the test made of it in the months of July and August showed that it functioned properly, and was a satisfactory engine. We therefore started production of it.

### Contract for 27,000 Engines

"It was estimated that we would require 22,500 of these engines to take care of the requirements of our Navy and Army. We therefore made contracts as follows:

"Packard Motor Car Co. .... 6000

"Lincoln Motors Co. .... 6000

"Ford Motor Co. .... 5000

"Nordyke & Marmon. .... 3000

"General Motors Corp. (Buick-

Cadillac) ..... 2000

"Trego Motors Corp. .... 500

"The first of these contracts was signed in August, 1917, and production work started immediately.

"Difficulties attending production in general grouped themselves as follows:

(a) Machinery—none of the existing motor plants had machinery of sufficient

sizes to handle the parts of the Liberty engines.

"(b) Small tools, fixtures and equipment—To produce every part of the Liberty engine requires between 2500 and 3000 of such small tools, jigs and fixtures.

"(c) Labor—It was soon found that men who were able to make the comparatively simple automobile motors did not have the skill required to machine parts of Liberty engines.

"(d) Unfriendly influence—Some of them were the result of pro-German influence.

"(e) Governmental activities—Every department of the Government was anxious to secure for its special work a large number of tool makers and skilled mechanics.

"(f) The Draft—This took a great many men out of this employment.

"(g) Materials—The materials required for the engines were of a much higher grade than corresponding material in automobile motors and work was required to secure proper production of materials.

"(h) Transportation and Coal—During the winter of 1917-18 the difficulties of transportation and of securing fuel were at times almost insurmountable.

"The Liberty 12-cylinder engine as originally designed was of the 300 hp. class producing approximately 330 hp. All the parts of the engine were designed to stand the stresses incident to this horsepower. An aviation engine is required to have the lightest possible weight with the maximum of power developed; therefore, each part is strained almost to its limit.

### Liberty Horsepower Increased

"When we had succeeded in getting tools and equipment to build this 330 hp. type and had produced approximately 300 of them, we were advised by authorities in France that higher horsepower would be required. By readjustment of the parts the engineers stepped up the horsepower of this engine to 375, with the result that certain of the parts would not stand this strain, notably the crankshaft, and it was necessary to stop productive efforts and increase these parts to stand this additional power requirement.

"After several weeks work this was accomplished and when we had produced approximately 500 of this type we were again notified that an increase in power would be required and that what would be needed for the summer of 1918 would be 400 hp. or over.

"We, therefore, again delayed production while the engineers rearranged the engine parts so that the engine would develop approximately 440 hp. The resulting strain placed on all the parts of the engine was too great. We were



obliged to enlarge and strengthen crankshafts, connecting rods, bearings, etc., etc., together with all the adjacent parts.

"It became necessary to change the metallurgical specifications, which resulted in changes in the methods of the steel mills. In increasing the size of the parts all of the jigs, tools and fixtures in the machine building plants, the parts factories, forging shops, etc., were rendered obsolete and we had to construct new equipment to meet all these conditions, in order to meet the requirements as given to us by our aviation authorities in France.

"The extent and magnitude of these changes so required is illustrated by the fact that the engine when competent to develop 330 hp. weighed 785 lb. without water or oil, while when it was competent to develop 440 hp., it weighed 860.

#### 1100 Liberty 12's in a Year

"In spite of this difficulty, on May 29, 1918, one year after the first scratch of the pencil toward the design of the engine was made, we had produced and delivered into service 1100 Liberty 12-cylinder engines. This is an accomplishment which has not been equalled heretofore in this or any similar industry, either in this country or elsewhere.

"Much agitation has centered about the assertion that thousands of changes were made in this engine. This agitation is entirely incorrect and unfounded. The changes arranged themselves in 3 groups:

"(a) Design.

"(b) Increase of power.

"(c) Manufacturing limits.

"As to design—there have been but two changes in design in this engine since it was first laid out in May, 1917. One of these was to change the oil system from the so-called scupper feed to forced feed. Either system worked properly on the engine, but the latter system is fool-proof, while the former is not. We, therefore, substituted the latter system. The other design change was an alteration in one part of the connecting rod to allow the rod to have sufficient play without cracking.

#### Agitation Over Changes Unfounded

"The changes due to increasing the horsepower twice are covered by the foregoing subdivision. These were the results solely of the demands of our Aviation authorities that the power be increased.

"In manufacturing—As the engine was used in service and as the manufacturing progressed, it became evident that some of these limits should be changed and this action has been followed. This is the common practice in all manufacturing establishments. It has always been so on automobile motors and will always be so on any manufactured product. As new manufacturing processes are developed and as experience is gained manufacturing changes are always expected and are always made.

"Therefore, the agitation about changes in the engine, when examined and understood, is unfounded.

"The writer procured an order from

the head of the Equipment Division locking up the development of this engine in the Detroit District in charge of Major Heaslet, formerly vice-president of the Studebaker Corp.; Major Hall and a committee of manufacturers composed of: H. M. Leland of the Lincoln Motors Co., C. Harold Wills of the Ford Motor Co. and Messrs. Bell and Roberts of the Packard Motor Car Co.

#### Ablest Men Concentrated on Engine

"No abler men on engines and motors exist in the industry and it was clear that by devoting their entire time solely to this engine and by avoiding interferences with their efforts, we were adopting the very best possible method of securing quick and reliable results. Resulting production, which will be hereinafter detailed, demonstrates that this course of action was the proper one to be followed.

"The same method of concentrating authority was applied to other engines, including:

Hispano-Suiza .....	150 hp.
Hispano-Suiza .....	180 hp.
Hispano-Suiza .....	300 hp.
LeRhône .....	80 hp.

"During July, 1917, the Signal Corps had purchased a miscellaneous assortment of small engines which could be secured in this country, none of which proved of any substantial benefit.

#### Monthly Engine Production

"Real production began in August, 1917. The following table shows the total production of engines by months from that date to the present time:

1917	
July .....	66
Aug. ....	139
Sept. ....	190
Oct. ....	276
Nov. ....	638
Dec. ....	595
Jan., 1918 .....	705
Feb. ....	1004
March .....	1686
April .....	2214
May .....	2517
June .....	2604
July .....	3151
Aug. ....	3625
Sept. ....	3801
Oct. ....	5297
Nov. ....	3305

Total .....31,813

#### Types of Engines Produced

"The production of engines as to types is as follows:

OX-5 .....	8412
Hispano-Suiza .....	4101
LeRhône .....	1178
Lawrence .....	451
Gnome .....	280
A-7-A .....	2250
Bugatti .....	11
Liberty .....	15,131

Total .....31,814

"The total amount of horsepower produced up to Nov. 22, 1918, is as follows:

OX-5 .....	757,080
A-7-A .....	225,000
LeRhône .....	94,240
Hispano-Suiza 150 .....	532,350
Hispano-Suiza 180 .....	97,920
Hispano-Suiza 300 .....	2,400
Liberty .....	6,052,400
Bugatti .....	4,400
Lawrence .....	10,824
Gnome .....	30,800

Total horsepower .....7,807,414

"The results achieved by the Liberty engine were so satisfactory to the Allies that commencing June, 1918, they were very insistent in placing with us large orders for engines. It soon became apparent that we would need additional sources of engine supply over and above the 22,500 which was originally planned for our own Army and Navy.

#### 5603 Engines Produced in October

"We, therefore, increased the number of manufacturers by adding the three plants of the Willys-Overland Co. at Elmira, Elyria and Toledo, and also the Olds Motor Co. at Lansing, Mich., to the list of Liberty producers. We also placed orders for 8000 8-cylinder Liberty engines with Willys-Overland and the Buick Motor Co. at Flint, Mich. When this was completed we had placed orders for engines as follows:

OX-5 .....	9,450
A-7-A .....	2,250
Gnome .....	342
LeRhône .....	3,900
Lawrence .....	451
Hispano-Suiza 150 .....	4,000
Hispano-Suiza 180 .....	4,500
Hispano-Suiza 300 .....	10,000
Bugatti .....	2,000
Liberty 12 .....	51,100
Liberty 6 .....	8,000

Total .....95,993

"Our production of engines of all types during October was 5603 of which 3878 were Liberty 12-cylinder. Under the above increased contracts we would have produced during January, 1919, 8000 engines per month which would have increased during the succeeding 4 months to a production of 10,000 engines per month.

#### Rolls-Royce Production

"The best known engine which is comparable to the Liberty is the Rolls-Royce, which is the most prominent English engine. Our advice last summer from the English authorities was that the largest weekly production of Rolls-Royce engines had been 59 and that the average weekly production was 45 engines. It will be noted that during the month of October, we were producing over 150 Liberty 12-cylinder engines per working day.

"The Rolls-Royce engine develops approximately 100 hp. less than the Liberty and weighs approximately 100 lb. more than the Liberty.

"During the month of October we produced of all types of engines a total of 5603. This is more than the total production of France and England during

one month during the four years of the war.

"By following the foregoing method of production, we have achieved the following results:

"1. Designed, developed and put into production during 1 year a 400 hp. type of perfectly satisfactory performance.

"2. Designed, developed and produced within 18 months over 15,000 of these engines.

"3. Produced during 18 months engines of all types totalling 31,814.

#### Liberty Engine Versus Foreign Type

"No production of a foreign type of engine would have produced any corresponding result. The difficulties, troubles and delays would have at least equalled those experienced on the Liberty, and the result would have been much less satisfactory.

"That the result has been satisfactory is apparent from the entire course of aviation during the past few months, which is illustrated by the three following incidents:

"1. The English aviation authorities cabled in June, 1918, that the Liberty engine test had shown it to be a satisfactory aviation engine, and that it was America's greatest contribution to the aviation activities of the war.

"2. Count Poiniatowski, who is the official representative in this country of the Hispano-Suiza Co., stated that Mr. Birkigt, who is one of the leading French aviation engineers, after examining the first 3 Liberty engines sent by us to France, stated that they excelled any engine of that type or size which had been developed in France.

#### Most Satisfactory Engine Available

"3. The experience of the aviators on the front and their opinion of the Liberty engine as given to us by Major Brett on his return from France is that it is the most satisfactory engine to operate that was available to them.

Accessories were discussed by various Army officers as follows:

"The guns on an airplane include a fixed machine gun in front which is aimed by pointing the entire plane and, in case of a two-place machine like the DeHaviland 4, the gunner in the rear has flexible machine guns which he can aim in almost any way.

"These guns are special, different from other machine guns, and to a large extent require special ammunition. There is almost no part of the entire armament equipment of an airplane that is not special.

#### Marlin Forward Gun

"After the declaration of war, the only quickly available arm for the fixed forward gun was the Marlin type. The Browning had not yet been developed; therefore, the Marlin was adopted and has been eminently satisfactory, and, in fact, equals the very best on the front.

"The synchronizing of the gun, that is to say timing the shots from the engine, so that the shot would fire through the

propeller without striking its blades, is a problem never before solved for the Marlin gun and it was necessary to develop the synchronizing device, which permits firing the shots through a propeller revolving at speeds varying from 600 to 1650 r.p.m.

#### Mounting of Gun Complicated Problem

"The mounting of the Marlin gun, including provisions for ammunition, discharge of the empty shells and discharge of the disintegrating steel belt, was in itself a complicated problem.

"For the flexible gun shown on the rear cock-pit of the DeHaviland 4, the Lewis gun, the only machine gun not using a bolt, was adopted. This involved redesigning the gun to take U. S. ammunition, increasing ammunition capacity 47 to 97 rounds per container, and part of the problem of the flexible mounting which is before you.

"The gun sights involved special lenses, previously made in Germany. The development of optical glass in this country is a story by itself.

"The greatest credit is due to the engineers of the Ordnance Department of the Savage Arms Corp. and of the Marlin-Rockwell Corp. for the wholehearted way in which they at their own expense as far as the latter two are concerned, conducted experiments night and day to solve these problems.

#### Airgun Production

"The production question involved in developing from nothing two types of aircraft machine guns to actual shipments in less than 12 months of about 30,000 Lewis flexible type and 35,000 Marlin fixed type is worthy of note.

"The fact that special ammunition is required for aircraft service should be remembered. The special cartridges include armor-piercing, incendiary bullets and tracer bullets, the latter showing a trail of smoke in the air indicating to the gunner the direction of fire.

"Much public discussion is heard of bombing from airplanes. The DeHaviland 4 machine shown may be used as a day bomber. The various bombs and bomb dropping devices are shown at the side of the room.

#### Various Types of Bombs Employed

"Demolition bombs used to destroy permanent structures are made in sizes varying from 50 lb. to 1000 lb.

"Fragmentation bombs are for use against troops. They explode just above the ground and send small fragments in all directions.

"Incendiary bombs are made in two forms: One to scatter small burning particles over a large area, the other for a more concentrated flame.

"Parachute flares are a form of bomb used to light the target in night bombing. They are interesting, as they contain a complete parachute which supports a flare to drop slowly after the explosion of the bomb, and shed a brilliant glare of light.

"The instrument equipment involved a great variety of problems.

"The self-luminous radium dials required for practically all instruments immediately became a production problem.

"How the General Electric Co. in 8 weeks time was producing 250 airplane compasses per week and how the minute chains in the aneroid barometers which serve as altimeters were secured from Switzerland, how the air speed indicators are all calibrated in a wind tunnel and how the National Cash Register Co. developed the tachometer are each stories of absorbing manufacturing interest.

"At the outbreak of the war in 1914 aerial photography for military purposes was a new subject; no special camera equipment was available, neither was the equipment for developing and finishing negatives in the field with the extreme rapidity demanded.

#### Initial Aerial Photography

"The first aerial work was done with cameras held in the hands. These were quickly replaced by cameras attached to the side of the planes, and later working through the bottom of the fuselage.

"The later development consisted of cameras supplied with plate magazines. The power to operate these magazines was furnished from a small windmill.

"This general line of development went on to an automatic camera, which could be put in action by the pilot and given no further attention during a reconnaissance, leaving the pilot free to fly and fight.

"Further development included a film camera for long range reconnaissance work.

#### Cameras Are Developed

"At the outbreak of the war it was possible for the aerial photographer-observer to fly at low altitudes, but as the importance of photography increased the enemy were more aggressive in bringing down photographic observers. This fact greatly increased the altitude from which photographs could safely be taken, and it was frequently necessary to make exposures from an altitude of 17,000 ft. This increase in altitude required lenses of longer focus and a number of cameras having 50 in. lenses were employed.

"Long experience in interpreting photographs has made possible the location with absolute accuracy of concealed batteries, machine gun nests, barbed wire, and even the paths followed by the soldiers.

"The development of cameras and photographic equipment to get these really marvelous photographic results involved the most extensive optical, chemical and mechanical research work. Much of this had been carried to a high degree of perfection by our Allies, who sent the very best men they had to this country to aid in initiating the work in the United States.

#### Development of Radio Apparatus

"Prior to the outbreak of hostilities in August, 1914, radio apparatus had not been used to an appreciable extent on airplanes. The development of suitable radio telegraph apparatus was under-



taken and this method of communication soon became extremely important and valuable in fire control work, where observation planes are used to correct the firing of long range artillery. At the time the United States entered the conflict satisfactory radio telegraph apparatus was in use by the combatant forces. Enormous improvements have been effected, however, by the Signal Corps and the Air Service of the United States, in apparatus designed for fire control telegraph signals. The sets which have been made and supplied in thousands to the American Expeditionary Forces are far superior to any apparatus developed by the other nations at war.

#### Radio Telephone

"In April, 1917, the radio telephone for airplanes was in much the same state of development that the radio telegraph was in August, 1914. The airplane wireless telephone is by far the most striking method of using radio communication on airplanes.

"By means of this device the commander of an Air Squadron can direct by voice the movements of the entire group of airplanes under his command, thereby making the Air Squadron a real military unit. The recent developments in aero fighting abroad indicate the inestimable value of this ability to command the units of a squadron.

"Among other uses for the radio telephone is the communication which can be had between airplanes and ground by telephone, which may become of enormous importance in future use of aircraft. A pilot could thereby talk directly with a general, without intermediate delay and confusion.

#### Radio Compass

"A different type of apparatus recently developed enables the observer in an airplane to locate by means of radio signals sent from a land station his position with reference to certain fixed points. The observer can therefore direct the flight of the airplane in any predetermined manner by means of this radio compass. The uncertainty attached to the use of the magnetic and gyroscope compasses for airplanes makes the use of the radio compass a practical certainty.

"The problems encountered in working out suitable airplane radio apparatus have been principally eliminating the overwhelming effect of the noise of the motor; the reduction of weight to the smallest possible value; the necessity of absolute freedom from fire hazard; simplicity which would enable fliers untrained in the use of radio apparatus to operate the same, and eliminating the vibration of apparatus in the airplane.

#### Maintenance and Care of Fliers

"One of the most important works undertaken by the Department of Military Aeronautics has been the maintenance and care of fliers. This endeavor has been carried on under the direction of Brig. Gen. T. C. Lyster through the Medical Section of the Department of

Military Aeronautics. The most important device for maintaining the health and efficiency of the flier is the oxygen apparatus which is designed to feed oxygen to the personnel of planes and maintain at all altitudes proper atmospheric conditions.

#### Fliers' Fatigue Cause of Most Deaths

"The great necessity of efficiently maintaining fliers was brought about through a study of the English air casualties during the first year of the war. These were about as follows: Two per cent due to the Hun; 8 per cent due to the plane, and 90 per cent due to the men, which clearly indicated that something was radically wrong with the personnel, and immediate action was necessary. A thorough study of this situation disclosed the fact that practically all of the flying personnel was suffering from what was known as oxygen fatigue or lack of oxygen being caused by flying so many hours of the day at high altitudes and not securing enough oxygen to properly feed the body.

#### Oxygen Equipment

"To design an oxygen equipment which would be entirely automatic, one that would be reliable and efficient, necessitated the building of a device which embodied several instruments and one that would overcome many variable conditions.

"It was necessary to have a device that would work under variable tank pressures from 100 lb. to 2250 lb. per square inch with a temperature range of from 70 deg. to 80 deg. F. to 20 deg. or 30 deg. below zero. To overcome these variables necessitated a very thorough study of temperature and pressure effects upon metals and considerable experiment. In addition the apparatus must deliver the required quantity to either one or two men at every altitude from 3000 to 30,000 ft.

"The first apparatus was designed for the British Air Service by Lieut.-Col. Droyer of the British R. A. M. C., and was made at the plant of DeLestang at Paris. The demand for this apparatus was so great that an automobile was kept waiting at the plant for each apparatus as it was finished and was especially rushed to the front.

"An indication of the importance of oxygen is shown by the record of the Twenty-fifth Squadron, Ninth Wing, R. F. C. This was the first squadron to use oxygen equipment on planes in the British service. They were using the original Droyer apparatus and found it efficient, sufficiently at least for Major Birley, who was in charge of the squadron, to state that this squadron, in his opinion, was giving six times the service of any other British squadron.

"An original model of the French-made apparatus was brought to this country to start quantity production. The French apparatus was a hand-made device, each part being carefully fitted by an individual workman. Under the direction of Brig.-Gen. T. C. Lyster, Medi-

cal Research Board of the Medical Section of the Department of Military Aeronautics, and the Bureau of Aircraft Production, the development and engineering of an oxygen apparatus to meet American requirements and to be adapted to American methods of manufacture was undertaken.

"The entire apparatus had to be redesigned, first, to take care of two men instead of one; second, to reduce the weight; third, to meet American methods of manufacture, and fourth, to make the apparatus more efficient and reliable. This work was started about the first of January, 1918.

#### Oxygen Equipment Division Established

"On May 3, 1918, six complete equipments, including apparatus, tanks, masks, etc., were sent overseas by special messenger to be actually tried out on the front. On May 31 the first production shipment of 200 apparatus was made. To date over 5000 have been manufactured and accepted by the Government, over 3600 have been shipped to ports of embarkation and over 2300 have been floated overseas, this production ranging from a rate of about 400 per month in May to 1000 per month in October.

"The importance of oxygen equipment necessitated the establishing overseas of a special oxygen equipment division to take care of the application of these equipments on planes.

"All military planes flying over an altitude of 10,000 ft. are equipped for the application of oxygen equipment. The following type of planes all use oxygen equipment: Day bombing, pursuit and chase planes and a percentage of both night bombing and Army and Corps Observation, this percentage depending on the altitude at which these types of planes will fly."

#### Aero Mail Aerodrome for Philadelphia

PHILADELPHIA, Nov. 29—In an address before the Engineers Club of Philadelphia Charles N. Knight, superintendent of the aero mail division of the Philadelphia post office, said that Philadelphia, or some nearby point in the State, is expected to be selected as the site for an aerodrome that will cover 100 acres.

#### Panama Business Conditions

WASHINGTON, Nov. 29—Panama, which imported \$63,000 worth of automobiles, \$64,000 worth of automobile supplies, \$60,750 worth of automobile tires and \$89,000 worth of gasoline from the United States in 1917, is reported to be suffering from dull business by the American Consul General there. The condition is due to the temporary stoppage of merchandise from the United States, which would indicate that the return to peace times may find a demand for automobiles from that country. The investment of much capital is not advised under the present conditions. General agricultural interests have attempted little or no development.